

AQUATIC NEMATOCEROUS DIPTERA

BY

OSKAR AUGUSTUS JOHANNSEN

Reprinted from N. Y. State Museum bulletin 68, Aquatic Insects in N. Y. State

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UNIVERSITY OF THE STATE OF NEW YORK

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AQUATIC NEMATOCEROUS DIPTERA

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In the following pages will be given an account of the life histories of a number of small flies, commonly known as black flies, (Simuliidae), mosquitos, (Cnecidae), and midges, (Blepharoceridae and Chironomidae). The material on which this study is based was for the most part collected in the vicinity of Ithaca N. Y., though some of it came from Saranac Inn N. Y. and elsewhere. The larvae were collected by means of a small hand net from the ponds; or swept by means of a brush into a cloth "sag-net" from the surface of the rock on the bottom of the shallow creeks in the manner described by Professor Needham in United States National Museum bulletin 39, 1899, part O, page 5. The material thus collected was then transferred to the breeding cages. These cages for the pond-water larvae consist of small glass jars containing some water plants. For those forms that require rapidly flowing water a jar was used from which the water was drawn by means of a continuous siphon as rapidly as it entered.¹

The material was collected during the summer of 1901, and studied during the fall of the same year in the entomological laboratory of Cornell University, under the direction of Prof. J. H. Comstock, to whom I wish to express my thanks for his advice in the preparation of this work. I also desire to acknowledge my obligation to Prof. J. G. Needham, of Lake Forest University, who suggested the work, directed its course and supplied me with material; to Professor Aldrich, of the University of Idaho, Professor Smith, of New Jersey, Professor Kellogg, of Leland Stanford Jr University and Messrs MacGillivray and Houghton for material from various localities.

The object of the paper is to give the distinctive generic and specific characters of larvae and pupae of the forms studied,

¹ See Comstock. Insect Life, p.330.

tabulated in the form of keys, to enable any one having an elementary knowledge of entomology to identify members of this interesting group of insects.

The Simuliidae are treated at greater length than the others, more material being at hand for the study of this family. In the descriptions of the wings of the adult, the nomenclature of Comstock and Needham (1898) has been followed.

The aquatic larvae of the Diptera may be distinguished from aquatic larvae of other insects by the absence of true, jointed thoracic legs; in having abdominal prolegs, or in being entirely legless; in the most degenerate forms the head is reduced and retracted within the pointed apex of the thorax, and no appendages of the imago are visible. Their pupae either have prominent prothoracic dorsal spiracles, often borne at the end of the antennaelike processes, or the pupa is formed in the hardened larval skin. The adults have but two wings, or in a few rare cases are apterous. The presence of the balancers and the absence of caudal filaments distinguish them from the males of the Coccidae. The most familiar examples are house flies and mosquitos.

The Diptera in general are divided into two suborders:

- Larvae with a differentiated head; pupae free or inclosed in the larval skin; in either case the larval skin bursts for the extrication of the pupa or imago in a T-shaped opening on the back of the anterior end, or rarely in a transverse rent between the eighth and ninth abdominal rings. The imago lacks the frontal lunule and ptilinum. Examples are the gnats, midges, crane flies, horse flies, snipe flies, robber flies, etc. (Nematocera and Brachycera) *Orthorrhapha*
- Larvae without differentiated head; pupae always inclosed in the hardened larval skin (forming the so called puparium); the imago always escaping from the anterior end through a circular orifice. Frontal lunule present; ptilinum usually present. Examples of this suborder are flesh and horse flies, bots, drone flies, etc. Among these are but few having aquatic larvae—a few Syrphidae, some of the Sciomyzidae¹ and other Acalyptrate Muscids. . . . *Cyclorrhapha*

¹See N. Y. State Mus. Bul. 47. 1901. p.577.

KEY TO FAMILIES OF NEMATOCEROUS DIPTERA

Larvae

- 1 Mandibles opposed, with the jaws moving in a horizontal plane; when the mouth parts are rudimentary, the larva has 13 segments and is peripneustic¹ (2).....*Nematocera*
Mandibles parallel, their motion in a vertical plane; if the motion is obliquely inward, then the head is not sharply differentiated from the first thoracic segment*Brachycera*
- 2 Larva with fully differentiated head, non-retractile, which contains the first ganglion and sometimes the eyes, peripneustic or amphipneustic,² with breathing tube or tracheal gills.....(3).....Tribe *Encephala*
Larva with only a "jaw capsule" (Kiefer kapsel).....(14)
- 3 Terrestrial forms, living in the earth, in rubbish, under bark, or in fungi...(4)
Aquatic or semiaquatic.....(6)
- 4 Larvae without thoracic prolegs.....(5)
With thoracic prolegs. Living under bark.....*Ceratopogon*
- 5 Body bristly; head usually with eyes.....*Bibionidae*
Body not bristly, head usually without eyes*Mycetophilidae*
- 6 Prolegs at least on fourth and fifth segments (i. e. on first two abdominals) (7)
No prolegs on these segments.....(8)
- 7 Spiracles on the first and last segments, with tracheal gills, and a very long membranous breathing tube.....*Ptychopterinae*
No long respiratory tube; larva swimming in a U-shape.....*Dixidae*
- 8 Body flattened, onisciform, and usually with suckers underneath.....(9)
Body more or less cylindric, without suckers on the intermediate segments...(10)
- 9 The segments alternating small and large, the outline of the body, serrate. Living in rapid flowing streams.....*Blepharoceridae*
The segments gradually larger at the middle of the body, becoming smaller again toward the posterior end.....*Psychodidae*
- 10 With thoracic prolegs.....(13)
Without thoracic prolegs.....(11)

¹Spiracles confined to the median segments. The Chironomidae usually have jaws which move in oblique planes.

²Spiracles confined to the first and last segments.

- 11 Thorax enlarged; abdomen usually with long hairs; usually a complex respiratory apparatus at the anal end.....*Culicidae*
Body much elongated.....(12)
- 12 Last segment of the abdomen with two fleshy points.....*Rhyphidae*
Last segment tapering, often with a few long hairs. Body snakelike, segments of nearly uniform length. (*Ceratopogon*).....*Chironomidae*
- 13 With anal prolegs and blood gills. (*Chironomus*, *Tanytus*, etc.).....*Chironomidae*
Without anal prolegs; a broad abdomen, with a terminal sucker; head with a pair of fanlike organs (black flies).....*Simuliidae*
- 14 With rudimentary mouth parts; body with 13 segments; peripneustic (i. e. spiracles on the median segments). Gall gnats.....*Cecidomyiidae*
With biting jaws. Head incomplete, small, retractile, not containing nerve ganglia; 12 body segments; posterior stigmata usually with some fleshy filaments (crane flies).....*Tipulidae*

Pupae

- 1 Prothoracic spiracles, if present, borne on appendages (*Nematocera*).....(2)
Prothoracic spiracles sessile.....*Brachycera*
- 2 Nonaquatic. Leaf miners or gall makers (*Cecidomyiidae*); larvae living in fungi (*Mycetophilidae*); larvae living in the earth (*Bibionidae*); larvae living under bark (some *Ceratopogon*)
Aquatic or semiaquatic.....(3)
- 3 Pupae in a fibrous cocoon.....(4)
Without cocoon, sometimes in the old larval tube.....(5)
- 4 Cocoon cornucopialike, the coarse thoracic filaments of the pupa projecting. These filaments are usually few in number.....*Simuliidae*
Thoracic filaments of the pupa if present, entirely within the cocoon, the latter usually subcylindric.....Some *Chironomidae*
- 5 Body convex, hard shelled, and attached limpetlike to the rock.....(6)
Not attached nor limpetlike.....(7)
- 6 Shield-shaped, flattened. Thoracic breathing tubes are subcylindric.....Some *Psychodidae*

¹See Professor Kellogg's paper in *Ent. News*, Feb. 1901.

- Convex, oval; breathing tubes composed of several lamellae.....Blepharoceridae
- 7 Prothoracic respiratory appendages simple, slender, antennaelike; pupa sluggish or motionless.....(8)
- Prothoracic appendages short and pointed, or club shaped, or composed of numerous fine filaments, or entirely wanting(9)
- 8 First abdominal segment about as long as those following it.....Some Psychodidae
- First abdominal segment about half as long as those following it.....Tipulidae
- 9 Prothoracic appendages short and pointed.....Rhyphidae
- These appendages not as above.....(10)
- 10 With two rounded paddlelike appendages at the caudal end.¹ Pupa active.....Culicidae
- Without distinct paddles (if present, then pointed, and with ciliate margin)...(11)
- 11 The caudal end with two pointed processes and usually bent forward over the pectus; the pupa resting on its side.....Dixidae
- Prothoracic appendages either many branched, simple or apparently wanting, the pupa in the larval tube (Chironomus) or active, Culexlike (Tanypus); or floating nearly motionless (Ceratopogon)Chironomidae

The above keys are modifications of those given by Mr C. A. Hart, Illinois State Lab. Nat. Hist. Bul. 1895. v.4, art.6, p.186-89.

To determine the imagines, the reader is referred to Comstock's *Manual for the Study of Insects*, or to Williston's *Manual of the North American Diptera*.

Family BLEPHAROCERIDAE

Net-winged midges

These flies are of moderate size, elongate and bare, with long legs and broad wings. The ocelli are present; the proboscis is elongated; the antennae are slender, composed of from six to 16 joints, clothed with short pubescence. The thorax has a distinct though interrupted suture. The empodium is very small and the pulvilli are wanting. The wings are broad, without hair, with a projecting anal angle; characterized by a network of fine lines which extend in various directions and not

¹Corethrella (q. v.) is an exception: having two pointed caudal lobes.

influenced by the veins of the wing, though apparently constant in position in a given species.

The larvae live in running water. The head has a pair of slender antennae; the cephalothorax and the following segments each with a conical process bearing a bunch of bristles; pupa flattened, inactive and free, inclosed in a semioval shell-like skin, the anterior end with erect breathing tubes; on the underside the skin is soft and transparent.

Genus **BLEPHAROCERA** Macq.

This genus is distinguished from the other genera of this family, in that the eyes are holoptic (i. e. contiguous); bisected by a unafaceted cross band or by a single groove. The radius (Comst.) is three branched (i. e. the second longitudinal vein is not furcate); and the vein M_3 with its basal end free and beginning in the middle of the wing. See figure in Comstock's *Manual*, p. 433.

Blepharocera capitata Loew

Berl. Ent. Zeit. 1863. Centur. 4; p.43

So far, but one species of this family, *Blepharocera capitata* Loew, has been recorded from this State. It is very abundant in several of the ravines about Ithaca, and larvae have been found in other parts of the State. The first adults observed the past year, emerged about June 1, and they had all disappeared by July 15. The fact that their season of flight is a short one, and that they are found only near the water's edge in deep and comparatively inaccessible ravines, accounts for the scarcity of the species in collections. The life history of this species has already been given by Prof V. L. Kellogg in *Entomological News* for January 1900, p.305-18; and the imago has been described by Loew in the *Berliner Entomologische Zeitschrift*, 1863, p.43. The life history may be briefly stated as follows:

The eggs have not yet been discovered. The larvae may be found throughout the month of May, in shallow but swiftly flowing water. About Ithaca they have been found most fre-

quently in the little stream flowing through Coy glen, in Six Mile creek, and in Cascadilla creek; and have also been collected by Mr A. D. MacGillivray in a brook near Axton N. Y. During the early part of May the larvae are still quite small, the smallest found measured 2.5mm in length, and were scattered over the smooth rock bed of the stream where the water is swift, but only about 1 inch in depth. If removed from the brook and placed in vials or still water, they soon die, usually within a few hours.

The larva is a curious black creature, flattened, its length being about two and one half times its breadth at widest part, each of the four intermediate segments separated from each other and from the cephalic and anal portion by deep constrictions, thus dividing it into six distinct parts. Kellogg says (in the paper just quoted) that the anterior, apparently single segment is composed of the fused head and three thoracic segments, while the most posterior part is composed of the last two abdominal segments, the intervening parts representing each a single abdominal segment. The larva is footless, but each body part bears a pair of small unsegmented, pointed projections, situated on the ventral aspect of the lateral margins. The organs of locomotion consist of six suckers, one of which lies on the median ventral aspect of each body part; thus there is but one sucker for the combined head and thorax, and but one for the last two abdominal segments. By means of these suckers, the larva clings to the rock bed of the stream. The larva occasionally moves about on the smooth surface of the rock, from the necessity of getting farther into the stream as the water lessens in quantity, and perhaps also, for seeking its food—the diatoms on the surface of the rock. The structure of the sucker is well described by Kellogg (*loc. cit.*). The larvae breathe by means of small tufts of short thick tracheal gills, of which there is a pair on the ventral surface of each of the first to the fifth abdominal segments. On the last segment there are two pairs of much larger, thicker, fingerlike processes, perhaps also tracheal gills. The writer collected during May many liv-

ing larvae, and attempted to rear them, by placing them in aquaria of running water, but succeeded with only four specimens. The first of these cast its larval skin on May 20; the second on the 25th, the third on the 26th, and the fourth on the 27th. The casting of the larval skin is most rapidly accomplished. A larva in the breeding cage attracted attention because of its grayish color, not so black as usual, the pale color owing, probably, to the skin being loosened. A moment later, perhaps half a minute, the empty larval skin was seen floating away, leaving the cream-white pupa on precisely the same spot which had been occupied but a moment before by the larva. In the new pupa, the constrictions of the body so distinctive in the larva, were still plainly visible; within half an hour they began to disappear, and the color gradually became darker. In from three to four hours the pupa had assumed its characteristic shape, and the coal-black color. The four empty larval skins examined, all had a small irregular break on the ventral surface just cephalad of the first sucker, and another small T-shaped opening on the dorsal surface opposite the one on the ventral. The rest of the skin, including the suckers, remained intact.

The pupa is coal-black, heavily chitinized, and is shaped like the half of a longitudinally cut egg, though somewhat more flattened. At the anterior end is a pair of dorsal, prothoracic tracheal gills, each gill consisting of four flattened plates. The whole of the flat ventral surface of the pupa is fastened so firmly to the rock that it is practically impossible to remove it without breaking the shell. The length of pupal life is from $16\frac{1}{2}$ to 18 days. If the pupae be taken from the water on the piece of rock to which they are attached, removed to the aquaria, and placed with the heads down stream, under a small stream of water, no difficulty will be experienced in rearing them. A number of specimens reared in this way were observed by the writer to emerge. From five to 15 minutes are required for the imago to free its body from the pupal skin, the wings remaining folded till the abdomen is

free, when suddenly they spread out fanlike and held above the surface of the shallow water, the legs all bunched up and still remaining in the pupal skin. The force of the flowing water and the struggles of the insect in from one to five minutes cause the legs to draw out, and, thus liberated, the imago immediately takes flight. In deeper water the wings probably do not unfold till after the insect is washed to the surface, though no observations were made upon this. Figures of larvae and pupae may be found in Comstock's *Manual*, and in Kellogg's papers in the *Entomological News* for 1900, and in Cal. Ac. Soc. Proc. 1903.

Family SIMULIIDAE

Black flies

In this family the body is short and stout; the legs are short; and the tibiae possess spurs. The antennae are scarcely longer than the head, cylindric and 10 jointed; the two basal joints are differentiated; the others are closely united. Proboscis not elongated, with small horny labella; palpi are four jointed. The thorax is much arched, giving the fly a humpbacked appearance; the scutellum is small; the abdomen is cylindric, composed of seven or eight segments; the legs strong and not elongate. The wings are broad, iridescent, and not clothed with hairs. The veins near the costal border are stout; those on the other parts of the wing are very weak. [See pl.34, fig. 1]

The larvae are soft skinned, not slender, usually more or less constricted in the middle. The head is cylindric, with eye spots on each side. The head bears two large fan-shaped organs, which aid in procuring the food. Respiration is accomplished by means of three blood gills which are pushed out from the dorsal surface of the last abdominal segment (Miall & Hammond say from the rectum). On the segment back of the head is a foot armed with hooks, and on the posterior end of the body is a disklike sucker by means of which the larva clings to the rocks or to plants. The creature moves about on the surface of the rocks with a looping gait similar to that of a measuring worm, and a web is secreted which prevents its being washed away by the swiftly flowing water.

The pupae are incased in cocoons which are firmly fixed to the rocks, these cocoons sometimes occurring in dense masses, forming a carpetlike covering on the rocks; in other species they occur separately or in small groups. The pupae, like the larvae, breathe by tracheal gills; but in this stage the gills are borne by the prothorax. The adult fly, on emerging from the pupa skin, rises to the surface of the water and takes flight at once. Soon after this the eggs are laid.

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The life histories of some of the members of this family have long been known. Otto Fabricius in 1784¹ published an article, "Beschreibung der Atlasmücke und ihrer Puppe." A little later (1795) Schönbauer published his account of the immature stages of the Columbaez midge. He was the first to state that these earlier stages are passed in the water. In 1822 appeared Verdat's paper, on *Simulium sericeum* (= *S. reptans*, according to Schiner) in which he figures the pupa, the larva, together with enlarged details of the mouth parts of the latter. Among other early writings on life history may be mentioned Fries's

¹ Schr. d. Berl. Ges. naturf. Fr. 5:254-59, tab.3, fig.1-5.

monograph, *Simuliar* (1824), Westwood's *The Water Cress Fly* (1848) and Heeger's *S. columbaschense* (1848). More recently there appeared in proceedings of the Royal Society of Copenhagen (1886) a very useful paper by Fr. Meinert on "De eucephale Myggelarver," of which six or seven pages are devoted to *Simulium*, besides some very good figures. On the early stages of American species, Riley, in the report of the United States entomologist for 1884, p. 342-43, writes as follows:

The early stages of several of the American species have been studied. In the *American Entomologist* [June 1870, 2:227] under the heading, "The Death Web of a Young Trout" we described the larva and pupa with figures of a species afterward described by us as *Simulium piscicidium* [*ibid*, p. 367]. These larvae were said by Seth Green to live attached to stones in swift running water and to spin a silken thread in which young fish became entangled and killed. This statement created much excitement among fish culturists at the time, and really seemed very plausible. It was contradicted, however, by Sara J. McBride, of Mumford N. Y., in an article published in the same volume [p.365-67], and also by Fred Mather of Honeoye Falls N. Y., in private correspondence with us. Mrs McBride found that the perfect flies issued about April 1, and June 1 thereafter the larvae were found in the streams in great numbers—as a general rule attached to water plants 3 or 4 inches below the surface of the water. Some were also attached to stones at the bottom. The majority were fastened to green decaying water cress, and these were green in color, while others which held to dead forest leaves of the previous year's growth, which had become entangled in the cress, were brown. From this fact she justly argued that they fed on decaying vegetable matter. There was a succession of generations or broods throughout the season, the development of a single brood occupying about two months. The flies issuing in midsummer were smaller than those developed in the spring and fall, although no difference in the size of larvae and pupae was perceptible. In the same volume (229-30), Osten Sacken gives an account of an undetermined species found attached to the roots and plants in swift running streams in the vicinity of Washington. This article contains also an able review of previous writings on the subject and is illustrated with figures taken from Verdat. In the *American Entomologist* [Aug. 1880, 3:191-93] Dr W. S. Barnard described the stages, with figures of the eggs, of a common species in the mountain streams around Ithaca N. Y. The eggs

were found on the rocks on the bank a few inches above the surface of the water; the newly hatched larvae were just at the surface, and from this point there was a regular gradation in the size of the larvae down into the stream. The eggs were found abundantly on June 1. In the proceedings of the Boston Society of Natural History for January 1880, Dr Hagen described *Simulium pictipes*, a remarkably large species, the larvae and pupae of which were found in the rapids of the Ausable river, Adirondack mountains; and in mentioning the fact in the *American Naturalist* for April 1881, we stated that the larvae and pupae of presumably the same species were found by Messrs Hubbard and Schwarz in the rapids of Michipicoten river, north shore of Lake Superior. The larvae were there found to have the peculiarity of floating in long strings, attached to each other by silken threads, while the pupae, found in the quieter pools close by, resembled coral. We also hazarded the statement that these were the immature forms of the celebrated black fly of the Lake Superior region. In reference to the probable identity of the Adirondack with the Lake Superior species, Dr Hagen, in comparison of the specimens of these larvae and pupae, received from Mr Hubbard, with similar stages of *S. pictipes*, remarked [*Canadian Entomologist*, 13:150-51] that, while the larvae and pupae did not differ materially, imagoes from the Lake Superior, not raised from the pupae collected by Mr Hubbard, differed from *S. pictipes* in the much smaller size and in the color of the legs.

The report of the United States entomologist for 1886 contains detailed account of the life history of two species, the southern buffalo gnat and the turkey gnat. This paper is the most complete record we have of any species of *Simulium* in this country.

Economic importance. In the northern states the attacks of the black flies on domestic animals, though causing considerable loss to the stock raiser, is not of such a nature that accurate statistics can be obtained. Otto Lugger, late state entomologist of Minnesota, in his report of 1896, p. 201 and 203, says:

The losses caused by this insect are, in some years, very great, and the state of Tennessee alone lost in 1874 as much as \$500,000. This southern buffalo gnat occurs as far north as Minneapolis, at least a few specimens have been found there. Here in Minnesota we have a number of other species of this family of flies, which cause more or less injury to our stock.

The first species seen and felt occurs early in the spring, soon after the snow disappears. It is a very small species, which flies with great force so that it can be felt when striking the face. It seems that it does not care much for human blood, but it irritates considerably by being of a very inquisitive nature, even entering the mouth, nose, ear and what is worse, the eye. If horses are left standing for some time in the roads, they are apt to become restive, shake their heads in a violent manner, frequently stamping and snorting at the same time. If the ears of the horse are inspected, we usually find the cause of their irritation in a large number of such small flies, which are busily engaged in sucking the blood, and they do so by inserting their powerful piercing organs into a vein, hence they seem to be arranged in regular rows. If not occurring in very great numbers, they cause but little harm, and an application of a little grease rubbed together with a few drops of carbolic acid, soon remedies the evil, and drives away other intruders. This species flies from May 15 to June 1, and very likely breeds in the Mississippi river near Minneapolis, though the earlier stages have, as yet, not been found. A little later in the season, but chiefly during June and July, a somewhat larger species (*Simulium decorum* Walker) becomes numerous. This species occurs sometimes in large numbers, but only females have been found thus far. This is of course easily explained by the fact that only the females of these flies are bloodthirsty; the males remain near the place of their birth, some running water, and, as they have only a rudimentary mouth, they could not imbibe blood, even if they were inclined to do so. This fly attacks, by preference, cows, and is sometimes found in such large numbers as to cause some injury to them. They are found most usually in the ears, and between the legs, or wherever the skin of the animal is thin and not well protected with hairs. Sometimes the cows suffer severely from their attacks, and, being constantly irritated by these small tormentors, they lose in flesh and give less milk. The front feet are in constant motion, a habit all species have, and are utilized more as feelers than as legs. This species is found active during the whole summer and autumn, but only in certain places, which can however be very far from the breeding places, and these insects must possess some very powerful sense to detect their victims such long distances.

The damage done in the South is described by Riley as follows:

As far as can be learned the damage in Louisiana was but slight prior to 1850; but many animals were killed in 1861, 1862,

1863, 1864 and 1866. In this latter year the parish of Tallulah La. lost over 200 head of mules, and upward of 400 mules and horses were killed within a few days in the parishes of Madison, Tensas, and Concordia, all in the same state. In other states they also did great damage. In 1868 many mules were killed in the lowlands of Davies county, Ky. Although frequently causing more or less trouble and loss, they did not appear again in such overwhelming numbers until 1872, 1873, 1874, 1881, 1882, 1884, 1885 and 1886. In 1872 it was reported that the loss of mules and horses in Crittenden county, Ark., exceeded the loss from all diseases. In 1873 they caused serious injury in many parishes in Louisiana. In 1874 the loss occasioned in one county in southwest Tennessee was estimated at \$500,000. The gnats have been especially injurious since the Mississippi floods of 1881, and 1882; in the latter year they were more destructive to stock than ever before, appearing in immense numbers in eastern Kansas, western Tennessee and western Mississippi, and the great destruction of cattle, horses and mules caused by them added greatly to the distress of the inhabitants of these sections of the country caused by unprecedented floods. Many localities along the Mississippi river in Arkansas also suffered severely. In 1884 buffalo gnats appeared again in great numbers and were fully as destructive as in 1882. In Franklin parish, La., within a week of their first appearance, they had caused the death of 300 head of stock. They were equally numerous throughout the whole region infested, and for the first time in the history of the pest they attacked horses and mules on the streets of the cities of Vicksburg and Memphis. No general outbreak took place in 1885, yet gnats appeared in sufficient numbers to kill quite a number of mules in various parishes of Louisiana, especially in Tensas and Franklin. Buffalo gnats appeared again in immense numbers in 1886, and extended throughout the entire lower Mississippi valley, and swarms were even observed and doing damage far away from the region usually invaded. They came very late in the season, and consequently animals were in better condition to withstand their attacks. The damage was great however in many localities where planters had not taken steps to protect their stock. Besides the actual loss by death to their stock, planters lose much valuable time in preparing their fields for the crops. It so happens that the gnats appear at a time when the ground becomes fit to be prepared for cotton, and, as it is very important to give that plant as much time as possible to mature, every day is very valuable in early spring. Planters owning large estates have to use their mules for plowing, notwith-

standing the gnats, while farmers on a small scale can keep their animals in the stable, thus protecting them.¹

Remedies and preventives

A number of remedies to counteract the poison of the buffalo gnats have been tried, but none of them have been sufficiently tested or have proved uniformly effective. The following applications have been of sufficient use to merit further trial: (1) Rubbing with water of ammonia, and administering internally a mixture of 40 to 50 grains of carbonate of ammonia to 1 pint of whisky, repeating the dose every three or four hours until relieved; (2) continued doses of whisky alone and keeping the animal in a cool and darkened stable; (3) immersion in cold water in running streams. Many cases of death of human beings from the bites of buffalo gnats have been reported, and some of them seem well authenticated. The painfulness of their attacks will certainly put people on their guard, but it would be well for persons in localities subject to their invasion to go prepared with some means of protecting themselves when far from shelter during the season of the year when the flies abound. The adults have so far appeared but little subject to attack from other animals. But few birds have been observed to feed upon them, though for the Southern forms the mocking bird, winter wren, and especially barnyard fowls, after the flies become gorged with blood feed upon them. Dragon flies, Libellulidae and robber flies, Asilidae, have been observed to catch them. The larvae are devoured in large numbers by the smaller fishes, minnows, etc., and probably the carnivorous beetle, bugs and other aquatic insects prey upon them. Dr Howard has observed in Washington the larvae of a species of *Hydropsyche* feeding upon the larvae of a species common in that locality. The pupae are pretty well protected by the resemblance in color to the objects to which they are fastened and their quiet habits. The eggs would seem to be open to the attacks of fishes, carnivorous beetles, etc., but no positive observations have been made. *Osborn*²

Very little can be done to destroy this insect in its earlier stages. The removal of obstructions in the rivers, which cause an acceleration of the motion of the water, would destroy some of their breeding places, but when there are so many this would make but little difference. Any chemicals to kill the larvae and pupae in the water would also kill fish, as they would have to be used very strong. The only way we have to protect ourselves

¹U. S. Dep't Agric. Rep't. 1886. p.502.

²U. S. Dep't Agric. Div. Ent. 1896. Bul. 5, n. s. p.37, 38.

and our animals are repelling substances, such as stinking oils and smudges. A number of repellents are sold, and some of them are very good, for instance the "Black-fly cream," made in Portland Me. Our fishermen and hunters frequently use a mixture of kerosene oil and mutton tallow, with which the exposed parts are greased. For animals any of the strong smelling oils can be used, but repeated applications are apt to hurt them or to remove the hair. Oil of tar is a simple and easily applied wash. To make it, a quantity of coal tar is placed in a large shallow receptacle in which is stirred a small quantity of oil of tar, or oil of turpentine, or any similar material. After filling the receptacle with water it is kept undisturbed for several days, when the animals to be protected are washed with the impregnated water whenever necessary. Smudges are the best as a protection and the animals soon realize their protection and crowd to them for shelter, even refusing to leave them when needed elsewhere. As the black flies are active during the day only, and the mosquitos towards evening and night, dwellers in our northern woods have a bad time of it and sometimes suffer very greatly on their account. It is easy, however, to drive these tormenters from houses or tents. By burning inside of them a little Pyrethrum powder (Persian or Dalmatian insect powder) upon a piece of bark these intruders are either killed or so stupefied that they do not bite for some time. This method is in general use in the houses and stores of the Hudson Bay Company, and the writer has always used it successfully in his numerous trips. The fumes of the burning insect powder are not very offensive, at least not nearly so much so as the poisonous bites of such insects as black flies and mosquitos. *Lugger*¹

Structural characters

There is but one genus of the family Simuliidae, *Simulium*, which possesses the characters of the family.

The eggs of the known species are deposited in a compact layer on the surface of rock over which water is flowing in situations as shown on plate 32. Their shape is elongate ellipsoidal, but they are usually closely packed with the long axis vertical and hence assume a polyhedral cross section. Eggs of the different species doubtless vary in size, those of the larger species (e. g. *S. pictipes*) measuring .40 by .18mm. In

¹Minn. Agric. Exp. Sta. 1896. Bul. 48, p.207.

Hungary the eggs of *S. columbatense* midge have also been studied. When first laid, they are enveloped in a yellowish white slime, which becomes darker, till, finally, it becomes black just before the emerging of the larva; the egg stage lasting about a week. For further notes on the eggs of *Simulium* see New York State Museum bulletin 47, 1901, page 408.

Larva. The larval stage of the known species lasts about four weeks in the summer, though longer in the cold weather. It is in this stage that it hibernates. Swift flowing water is essential to its life; if removed to quiet water, it dies within a day, and usually in a few hours. Fastened to the rock, twig or leaf by the anal end of the body, it assumes a more or less erect position and moves its head occasionally with a circling motion. It is able to move about on the surface of the rock or sides of the vessel in which it may be placed. Its manner of progression resembles that of the larva of a geometer moth, though not so rapid. Attaching itself by means of its thoracic proleg, it draws up its body in a loop, then, attaching itself by means of its caudal sucker, it releases the hold of its proleg. According to the unpublished observations of Miss R. Phillips (of the class of 1890, Cornell University), the larva feeds on algae, as *Nothix*, *Cladophora*, *Vaucheria*, on diatoms and parts of phanerogamous plants. Sand also has been found in the digestive canal.

Structure of the larva. The full grown larva of even the largest species does not exceed 15mm (about $\frac{5}{8}$ inch) in length. The body is somewhat cylindric in shape, enlarged at both ends, attenuated in the middle, the posterior half much stouter than the anterior part, and almost club-shaped [pl.34, fig.9]. Besides the head there are 12 poorly defined segments, the first two of which consolidate shortly before pupation. The color of the larva varies with the species, and perhaps also, to some extent, with the nature of its food. Some are a deep shining black, with paler incisures; others gray, yellow or dark green; in some the ventral surface is much lighter than the dorsal,

and in most of them the incisures are paler in color. On each side of the thorax is a triangular dark spot in the mature larva which marks the position of the developing tracheal gills of the pupa. The head is nearly quadrangular, a little longer than wide, dark brown or blackish in color, heavily chitinized, with two approximated irregular black eye spots on each side near the lateral margin.

The antennae are placed at the sides of the head toward the cephalic end, dorsad of and near the base of the fan. They are very slender, apparently three jointed, about one half as long as the width of the head. The first joint is twice as long as the others taken together, slender, flattened, and sometimes almost hyaline; cylindric at the articulation with the second. The second joint is very slender, cylindric. The third joint is a short pointed process at the apex of the second; and two similar processes are usually to be seen at the articulation of the first and second. The fans are placed laterally at the cephalic end of the head [pl.34, fig.7]. Each fan consists of from 30 to 60 scythe-shaped rays (variable with the species), ciliate on the inner side, with longer setae at regular intervals [pl.34, fig.7, 8]. Each ray is widened dorsoventrally on about its basal one fourth, and, when spread, presents the appearance of the arc of a circle extending over the width of the fan near the base. The rays of the fan are borne on stout peduncles, to which they are articulated. The fans seem to be used in sweeping food into the mouth of the larva. When closed, the tips of the rays come just to the oral opening. The rays are folded when the larva is disturbed, otherwise wide-spread. The mandibles are placed ventrad of the fans and move in a horizontal plane. They are elongate, rather stout, brown, nearly twice as long as wide, furnished with teeth on the inner side near the apex, from two to four large, black teeth at the apex, and from six to 15 paler colored teeth behind these, gradually decreasing in size, excepting that the last two are usually stouter and larger than those immediately preceding. The stout apical teeth are difficult to count because, lying in differ-

ent planes and covered by the hair, they are somewhat obscured. The mandible is furnished with a dense fringe of hairs extending over its apex, more or less overhanging the teeth. Near the base on the ventral side (the jaws moving in a horizontal plane) is a fan of hairs which projects mesad, at right angles to the long axis of the mandible. Ventrad and mesad of the mandible are the maxillae. The maxilla with its palpus projecting outwardly is shaped somewhat like a mitten, the palpus representing the thumb [pl.36, fig.2]. Several long fringes of hairs extending cephalad and mesad, cover the surface of the lacinia, among which is a single stout spurlike process. On the palpus are a few scattered bristles, at its base usually a small tuft of hairs, and its apex is provided with papillae. The chitinous labrum is a short, somewhat semicircular shaped piece overhanging the mouth, its plane being nearly perpendicular to the long axis of the larva. Externally it is stiffened by a T or Y shaped brace, the stem forming a longitudinal keel [pl.33, fig.11, and pl.36, fig.5]. Extending apically is a long fringe of hairs, and back of the suture, combed backward and outward, are long hairs. The apical margin is sometimes serrate. The hypopharynx, through which the silk thread passes, is a rather complex structure; it consists primarily of two flattened chitinized plates, connected by membrane, forming a flattened tube [pl.37, fig.2]. At the apical (cephalic) end of this is articulated a complex chitinous doubly arched segment with two fringes of long, coarse hairs. The ventral plate is somewhat quadrangular in shape, widened cephalad, with its anterior and posterior margins concave, and its lateral margins sinuous. On its anterior margin, apically, is a transverse chitinous comb [pl.36, fig.4]. The dorsal plate [pl.37, fig.2] is composed of two triangular pieces joined on the center line. On its apical (cephalic) edge is a transverse comb which projects cephalad and ventrad. This comb lies somewhat cephalad of the comb of the ventral plate. The dotted lines of plate 36, figure 4, mark the position of the dorsal plate. The ducts from the silk glands [pl.37, fig.2] pass up between the two plates, the

threads uniting as they pass between the combs of the dorsal and ventral plates. I believe the function of the upper plate to be a press for the silk thread. On each side, extending dorsad and caudad, is a chitinized, hornlike process. Only the fringe of hairs of the hypopharynx is visible when the larva is viewed from below, the rest being covered by the labium. The suture between the labium and the ventral surface of the head, indistinct in some species, seems entirely wanting in others, and therefore, the labium is immovable. The cephalic margin of the labium is furnished with regularly placed teeth; the arrangement of which, together with the number and arrangement of the setae on the ventral surface, furnishes some excellent specific characters. Since, in order to identify a species, it is necessary to dissect out the mouth parts, a few words in this connection will not be out of place here. If the specimen, either fresh or alcoholic, be placed on its side, and with a scalpel a frontal cut made through the head, passing just below the eye spots separating the dorsal from the ventral surface, then, placing the sections with the cut surface uppermost, the mouth parts may be readily picked out with a needle. In the ventral part will be found the maxillae, the hypopharynx and the labium. The hypopharynx lies very close to the labium and therefore requires some care to remove it. In the dorsal part will be found the fans, the labrum, and the mandibles. If the cut be made too far toward the dorsal surface, the mandibles will be attached to the ventral part, and the labrum will probably be destroyed, since it lies at right angles to the axis of the body, overhanging the mouth opening. The separate parts may then be dehydrated, cleared, and mounted on a glass slide.

The single thoracic proleg attached to the ventral surface of the first (or second?) segment is an elongate, truncate, conical process, at its extremity with a number of rows of hooks, similar to those found at the anal end, to be described later. The use of this proleg has already been mentioned. From a narrow, slitlike opening on the dorsal surface of the last segment of the body are projected the retractile, translucent,

respiratory filaments (blood gills). These are three branched, sometimes simple, often much lobed [pl.37, fig.9]. Caudad of these is a chitinized, X-shaped fold, the anterior branches extending cephalad and laterad for a short distance. At the caudal end, with its plane nearly at right angles to the longitudinal axis of the body, are concentric circles of tiny hooks, the center of the circle being hollowed out, suckerlike. The rows of hooks, though arranged in concentric circles, are also arranged radially, so that about 100 radii may be counted, each radius with from eight to 20 hooks (varying with the species, and perhaps also, with the age). The function of these hooks with the suckerlike disk is for attaching the larva to the rock or rubbish in the water, affording a very firm hold. In some species the circle is not quite complete, but is slightly open on the dorsal side. The larva possesses two silk glands, laterally placed, extending about three fourths the length of the body, then recurved, U-shaped, extending back to the thoracic segments. The outlets are the two ducts which lead into the hypopharynx [pl.37, fig.2]. The silk is used by the larva for attaching itself to the surface on which it rests, to prevent its being washed away by the rapid flowing water and to build its pupal case. According to observations made by Miss Phillips and recorded in her thesis (1890), the spinning of the cocoon of *S. pictipes* is described as follows:

“In spinning, the thread issues from the mouth and is placed in the different positions by the thoracic proleg. The head is bent down, and with the proleg the thread is drawn around the body and other threads placed or twisted in all directions, until a very irregular network is formed, covering the whole of the body, except the head. The skin of the head is then cast off, and the insect pulls itself out of the skin of the body, leaving it whole. The cast skin may often be found in the cocoon, with the pupa. The cocoons are commenced at the upper margin and spun continuously down to the caudal end, where several threads are drawn from the cocoon and attached to the last one or two of the body segments of the pupa. The threads hold

the pupa very firmly and are always found when the pupa is pulled out of its case. Spinning is rarely seen excepting when the insect is in a stream of running water."

The pupal cases are usually composed of a rough, tough, clothlike fabric, and vary in shape with the different species. Three types of cases are known to me. One is shaped like a shoe, entirely concealing the pupa [pl.35, fig.5]. This is sometimes slightly modified, the heel being less prominent, and the instep disappearing, i. e. shaped like a flattened cylinder, the planes of the bases being parallel, but oblique (*S. pictipes*, and in a California species). Another, the most common type, is like that of a wall pocket, the head and the thoracic filaments projecting.¹ The third type is structureless, composed of a matted mass of thread on the rock, sometimes only partly covering the pupa; as in *S. hirtipes*. Large numbers of pupal cases are frequently found matted together, carpetlike. The pupa are generally of a pale or golden brown color, the abdomen being somewhat darker. The eyes of the adult soon become visible, as also the legs and wing cases. Eight body segments are visible from the dorsal surface, not counting the anal. The respiratory filaments arise from a single stalk on each side; this stalk has a variable number of branches, which again subdivide into twigs. The number of twigs is constant for a given species, ranging from four (in a European species) to upward of 60 in one of our own. For a description of their structure see a paper by Dr Volger, *Die Tracheen Kiemen der Simulien Puppen*.

On the segments are a number of small, regularly arranged black hooks, by which the pupa is attached to the fibers of its case. The arrangement of these hooks appears to be uniform for a given species. The pupal stage lasts about a week, sometimes a little longer. The adult makes its escape from the pupal skin through a longitudinal rent on the dorsum of the

¹ See Riley's figure of pupal case in U. S. Dep't Agric. An. Rep't 1886, of *S. meridionale*, or U. S. Dep't Agric. Div. Ent. Bul. 5, n. s. 1896. p.53.

thorax, leaving the skin, together with the respiratory filaments, otherwise intact.

The generic characters of the imagos have already been given in sufficient detail in the characters of the family; to which need only be added that the tarsal claws of the male in all the species I have examined are trifid; those of the female being either simple or bifid. All the tibiae are provided with spurs, in a few species only are those of the fore legs rudimentary. The middle and hind metatarsi possess a more or less regular row of spines on the extensor margin, which are wanting on the fore metatarsi. On the second joint of the hind metatarsus at its articulation with the first, there is usually a leaflike appendage covering the base of the flexor surface [pl.38, fig. 1, 8, 9].

List of the North American species of Simuliidae, genus *Simulium*

Latreille, Hist. Nat. Crust. et Ins. 1804. 14:294.

1**argus* Williston, N. Am. Fauna, no. 7. May 1893. p.253. Cal. (Syn. of *S. vittatum* Zett. according to Coquillett, Harriman Exp. 1900. p.393).

argyropeza. See *reptans*.

**bracteatum* Coquillett, U. S. Dep't Agric. Div. Ent. Bul. 10, n. s. 1898. p.69. Mass., Cal., N. Y., Kan., Mich.

calceatum Harris. A catalogue name according to Riley. Am. Ent. 1870. p.467.

cincta. See *reptans*.

**cinereum* Bellardi, Saggio di ditterologia Messicana. 1:13. Cal. (Townsend, Baja. etc. 1893). Mex. (Bellardi).

columbatchensis Fabricius nec Schönhauser. See *reptans*.

decorum Walker, List of Dipterous Insects, etc. pt.1. 1848. p.112. Hudson Bay Ter. (Syn. of *S. vittatum* Zetterstedt, according to Coquillett, n. s. Bul. 10, 1898. p.68).

elegans. See *reptans*.

erythrocephala. See *reptans*.

**fulvum* Coquillett, U. S. Nat. Museum Proc. 1902. 25:96:

1898 *ochraceum* Coq. not Walk. Mont.; Id.; Col.; N. M.; Alaska.

**glaucum* Coquillett, U. S. Nat. Museum Proc. 1902. 25:97. Missouri.

**griseum* Coquillett, U. S. Dep't Agric. Div. Ent. Bul. 10, n. s. 1898. p.69. Col.

**hirtipes* Fries, Obs. Entomol. Pars, Monogr. Simuliar. 1824. p.17, 5. Tfl. 1, f.1. N. Y., Id., Cal.

The following synonymy is according to Schiner:

1830 *rufipes* Meigen, Syst. Besch. 6:311-17.

1830 *hirtipes* Fries, Meigen, Syst. Besch. 6:312-18.

1850 *hirtipes* Fries, Zetterstedt, Dipt. Scand. 9:3426-28.

1 Those names to which a * is prefixed I consider either a distinct species, or not sufficiently described to warrant placing as the synonym of another.

innoxium Comstock. See *S. pictipes* Hagen.

**invenustum* Walker, List of Dipterous Insects, etc. 1848. p.112. Hudson Bay Ter.

pecuarum Riley is a synonym of this, according to Coquillett, 1898).

**irritatum* Lugger. Figured but not described in Univ. Minn. Agric. Exp. Sta. Bul. 1896. p.203.

**meridionale* Riley, Dep't Agric. An. Rep't for 1886. 1887. p.512.

1891 *occidentale* Townsend, Psyche, July 1891. p.107. Mass., Miss., Neb., Tex. (synonymy and localities according to Coquillett, Bul. 10, n. s. 1898), N. J. (Johnson), Kans. and Id.

**metallicum* Bellardi, Saggio di ditterologia Messicana. 1859. 1:14. Mex.

**mexicanum* Bellardi, Saggio di ditterologia Messicana, Appendix 6. 1862. Mex.

minutum Lugger, Minn. Agric. Exp. Sta. Bul. 1896. p.202. Minn. (Figured but not described). See *vittatum*.

molestum Harris. See *venustum*.

novicum Harris, Ins. Inj. to Veg. p.601. This is a *Ceratopogon*.

occidentale Townsend. See *meridionale*.

**ochraceum* Walker, Ent. Soc. London. Trans. n. s. 3:332. Mex.

**pecuarum* Riley (Synonym of *invenustum* according to Coquillett).

1887 *pecuarum* Riley, U. S. Dep't Agric. Rep't for 1886. p.512. N. H., N. Y., Mass., Ct., D. C., Mich., Miss., La. (synonymy and localities according to Coquillett, U. S. Dep't Agric. Bul. 10, n. s. 1898), N. J. (Johnson).

**pictipes* Hagen, Bost. Soc. Nat. Hist. Proc. 1880. 20:305.

N. Y., Tex., Cal. (Coquillett, 1898) Id.

1895 *innoxium* Comstock. Name given in Manual for the Study of Insects.

piscicidium Riley. See *venustum*.

posticata Meigen. See *reptans*.

**pulchrum* Philippi, Chilian Diptera. 1865. p.633. S. Am. and St Vincent, W. I.

1896 *tarsale* Williston, Diptera of St Vincent, W. I. p.268.

Synonymy according to Hunter, Catalogue of S. Am. Diptera. 1900.

**quadrivittatum* Loew, Berl. Ent. Zeit. 1862. Centur. 2, p.2. Cuba.

**reptans* Linnaeus, Fauna Suec. 1893. Europe, Greenland (Lundbeck, 1898). 1761.

Synonymy according to Schiner:

1767 *sericea* Linnaeus, Syst. Nat. 12:978, 58

1776 *erythrocephala* DeGeer, Ins. 6:161, 37 (Tipula)

1781 *reptans* L. Schrank, Enum. Ins. Austr. p.985 (Culex)

1787 *colombatchensis* Fabricius, Mantissa Ins. 2:333 (Rhagio)

1804 *argyropeza* Meigen, Classif. 1:96

1818 *reptans* Meigen, Syst. Besch. 1:291-92

1818 *sericea* Meigen, Syst. Besch. 1:296-98

1818 *elegans* Meigen, Syst. Besch. 1:296-99

1818 *variegata* Meigen, Syst. Besch. 1:292-93

1823 *reptans* Fries, Obs. Entomol. Pars 1 Monogr. Simuliar, p.13

1830 *cincta* Meigen, Syst. Besch. 6:311, 14

1838 *posticata* Meigen, Syst. Besch. 7:52, 21

rufipes Meigen. See *hirtipes*.

sericea Linnaeus. See *reptans*.

***tamaulipense** Townsend, N. Y. Ent. Soc. Jour. 1898. v.7. Tex.

tarsale Williston. See *pulchrum* Phillipi.

tribulatum Lugger, Minn. Agric. Exp. Sta. Rep't 1896. p.205-7. Probably equals *vittatum*. (p.385. Seq.)

(Figured but not described)

***venustum** Say, Acad. Nat. Sci. Phil. Jour. 3:28; Compl. Wr. 2:51

Wiedemann, Auss. zw. Ins. 1:71. Ohio, D. C. (Osten Sacken, catalogue). N. J. (Johnson); Can., N. H., N. Y., Mich., Minn., Wyo., B. C., Cal., Tex., La., Miss., Fla., (Coquillett); Id. The following synonymy is according to Coquillett. 1898.

1862 *molestum* Harris, Ins. Inj. to Vegetation. (Not described)

1870 *piscicidium* Riley, Am. Ent. 2:367. Mumfords N. Y.

***virgatum** Coquillett, U. S. Nat. Mus. Proc. 1902. 25:97. New Mexico.

***vittatum** Zetterstedt, Ins. Lapponica. 1840. p.803. Staeger Groenl.

Antl. Greenland (Osten Sacken's catalogue); N. J. (Johnson); Alas. (Coquillett 1900); Cal., Kan., Minn., N. Y., Neb. (Coquillett 1898), Id., S. Dak. The following synonymy according to Coquillett.

1848 *decorum* Walker, List. Ins. p.112. Hudson Bay Ter.

1893 *argus* Williston, N. Am. Fauna, no. 7, p.253. Cal.

KEY TO SPECIES OF *SIMULIUM*

Larvae

- 1 Mature larva 6 or 7mm long, with the dorsal surface of the head nearly white; the rays of the fan number about 30.
Larva from Santa Cruz mountains, Cal. [p.387].
Head usually brown; rays of the fan usually 40 or more.....(2)
- 2 The top of the head with six black blotches or spots. Larvae from New Mexico [p.386].
Head without six dark spots.....(3)
- 3 The caudal blood gills are three simple papillae.....(4)
The three main branches are again subdivided.....(6)
- 4 The middle tooth of the labium is simple and pointed, labium with six pairs of setae on its ventral surface [pl.35, fig.2]. *vittatum*
The middle tooth at least is trifid.....(5)
- 5 All marginal teeth of the labium except the outer pair are trifid *hirtipes*
The middle tooth only is trifid; ventral surface with three pairs of setae [pl.33, fig.8]..... *pecuarum* (= *invenustum*)
- 6 Full grown larvae 10-12mm in length, black in color, its labium with an elongate middle tooth [pl.36, fig.3]..... *pictipes*
Paler larvae less than 10mm in length.....(7)
- 7 No setae on the last joint of the maxillary palpus, middle tooth of the labium longer than the two lateral ones, four pairs of setae on its ventral surface. The pair of apical setae of the mandible not differentiated from the hairs which overhang the apex..... *meridionale*

- Mandible with a pair of apical bristles, palpus of the maxilla with setae(8)
- 8 Middle tooth of the labium enlarged, ventral surface of labium with five pairs of setae [pl.37, fig.6].....*venustum*
- Middle tooth not enlarged (varieties of *venustum*).....(9)
- 9 Labium with four pairs of ventral setae [pl.37, fig.14].....var. *a*
- With seven pairs of setae [fig.5].....var. *piscicidium*

Pupae

(Arranged according to the number of filaments in each respiratory tuft)

- 1 With six filaments
- a* Legs in their cases appear bicolored¹.....*venustum*
- b* Legs unicolored.....*meridionale*
- 2 With eight filaments
- a* Pupa 4.5mm long; Arizona species. Pupa described in Am. Ent. Soc. Trans. p.45. 1893.
- b* Less than 4mm long; eastern species.....*venustum*, var. *piscicidium*
- 3 With nine filaments. Pupal case like that on pl.35, fig.5...*pictipes*
- 4 With 10 filaments.....var. *a* of *venustum*
- 5 With 12 filaments. Pupal case [pl.35, fig.5]. From Santa Cruz mountains, Cal. [p.387]
- 6 With 16 filaments.....*vittatum*
- 7 With 24 to 48 filaments [pl.33, fig.10].....*pecuarum*
- 8 With 60 or more filaments.....*hirtipes*

Imagines

- 1 Ground color of the thorax and abdomen deep yellow.....(2)
- Gray or black; its hairs may be pale.....(3)
- 2 "Femora with black tip, length of fly 2mm." Mexico.....*ochraceum*
- "Femora without black tips. Length 3 to 4.5mm. Rocky mountains"*fulvum*
- 3 Hind tarsi with its basal joint partly yellow; legs bicolored(9)
- Hind tarsi unicolored².....(4)
- 4 Halteres dusky; thorax not striped.....(5)
- Halteres white or yellow; the female with striped thorax and bifid tarsal claws.....(6)
- 5 Body black; the female with dense yellow pile, her tarsal claws simple; the male with dense hair on the legs, his tarsal claws trifid. The wing with its radius three branched. Length 3 to 4.5mm.....*hirtipes*
- "Body gray, legs reddish gray, feet black; length 3mm." This is said by Mr Coquillett to be the same as *pecuarum* Riley*invenustum*
- 6 Males, eyes contiguous.....(7)
- Females, eyes separated by a distinct line.....(8)

¹In order to see this it will be necessary to examine nearly mature specimens and perhaps to draw them from their pupal skins.

²The male of *pictipes* sometimes has legs nearly unicolored; it is however included in the preceding section.

- 7 Thorax velvety black; legs reddish with black tarsi. Length 1.5 to 2mm. Compare here also *bracteatum* (male), "with legs wholly brown.".....*meridionale*
 Thorax brownish black; legs usually pale; tip of tarsi not black. Length from 2 to 4mm.....*pecuarum*
- 8 Thorax with silvery white pubescence; legs brownish black, covered with whitish hairs. A small variety (less than 2mm long), from New Mexico has been named *occidentale* Town. (q. v.).....*meridionale*
 Thorax with yellow hairs; legs reddish brown, covered with yellow hair; tip of tarsi blackish.....*pecuarum*
- 9 Males, eyes contiguous.....(10)
 Females, eyes separated.....(20)
- 10 "Mesonotum wholly velvet black; gray spot on sides of the second, fifth, sixth, and seventh segments of abdomen. Length 1.5mm.".....*bracteatum*
 Metanotum striped, or with grayish or metallic reflections.....(11)
- 11 Dorsum of thorax with one or more longitudinal stripes.....(12)
 Dorsum unstriped.....(14)
- 12 Thorax with four longitudinal stripes; posterior margin white; abdomen black. Sex not given. Cuban species.....*quadrivittatum*
 Thorax not so marked.....(13)
- 13 Front and middle femora and tibiae wholly yellow; center of mesonotum with a black vitta, elsewhere gray. Length 1.5mm. Colorado species.....*griseum*
 Femora and tibiae wholly or partly brown.....(13a)
- 13a "Femora and front tibiae yellow, their apices brown; middle tibiae brown, a yellow ring beyond the base, hind tibiae brown, the extreme base yellowish. Mesonotum marked with a narrow median and laterally with a very broad velvet black fascia." Length 3mm. New Mexico.....*virgatum*
 Front femora brown, tibiae brown on apical part.....(13b)
- 13b Mesonotum with two narrow gray stripes (sometimes quite indistinct) on a velvet black ground, in which there are scattered golden hairs.....*vittatum*
 "Mesonotum marked with a narrow median and slightly wider lateral black vittae." Length 2.5mm. Missouri.....*glaucum*
- 14 Anterior femora yellow. Mexican species.....(15)
 Anterior femora black.....(17)
- 15 Abdomen with the base of the second segment, and the sides of the third, fourth, and fifth yellowish white; tibiae fuscous black with yellow bases. Length 4mm.....*mexicanum*
 Abdomen black.....(16)
- 16 Metallic bluish black species; middle portion of fore tibiae, base of middle and hind tibiae, base of first and second joints of middle and hind tarsi, whitish. Length 2mm...*metallicum*
 Thorax fuscous and cinereous pollinose; the humeri pallid, fore coxae pale, middle and hind ones dark; femora pale at the base, black at the tip; tibiae black. Length 3mm.....*cinereum*

- 17 An oblique metallic streak extending inward from each humerus; posterior part of the thorax metallic. Length 2 to 2.5mm.....*venustum*
Humeral spots not metallic.....(18)
- 18 Anterior coxae yellow; long hair on femora and hind tibiae; thorax velvet black with white pruinose margin (Greenland)*reptans*
Anterior coxae black.....(19)
- 19 Thorax velvet black, with oblique cinereous humeral spots, and usually two tiny metallic spots between them. Length 3 to 4mm.....*pictipes*
Thorax velvety black with two very narrow gray stripes and posterior margin; hind tibiae usually yellow at the base, hair on legs sparse.....*vittatum*
- 20 Thorax striped.....(21)
Thorax without stripes.....(25)
- 21 Dorsum of thorax with four longitudinal lines, posterior margin, white pollinose; abdomen opaque black. Cuban species*quadrivittatum*
Not with four stripes.....(22)
- 22 Dorsum of the thorax with five stripes, the outer ones spot-like, the intermediate ones clubbed at the ends; abdomen with black fascia on each segment, produced posteriorly at the middle and the ends. Sometimes the last few segments have only three or five spots.....*vittatum*
Thorax with one or three stripes.....(23)
- 23 With three stripes.....(24)
" With an indication of a darker median vitta " [*see* 31]....*griseum*
- 24 Small species, length about 1.5mm. "Abdomen silvery, third and fourth segments wholly brownish, sometimes with a median spot on each; legs yellowish, tarsi blackish or brownish." Species from Texas.....*tamaulipense*
Larger species 3mm. or more in length.....(24a)
- 24a Middle tibiae brown with a yellow ring beyond the base; vittae of mesonotum brownish, the median vitta dilated posteriorly, wider than either of the lateral ones. New Mexico*virgatum*
Femora and tibiae grayish, sometimes quite pale, tips of tibiae black. Laterodorsal thoracic stripes clubbed at the anterior end. Third, fourth, fifth, and part of sixth and seventh abdominal segments with velvet black fasciae; center of 6, 7, and 8, grayish or dull brown.....*pictipes*
- 25 Abdomen without distinct black spots.....(26)
Abdomen spotted.....(31)
- 26 Abdomen black, covered with long yellow pile; legs yellow, the tips of the femora and tibiae, and all the tarsi except basal two thirds of the hind metatarsi, brown.....*bracteatum*
Abdomen nearly bare.....(27)
- 27 Body gray or cinereous.....(28)
Body brown or black.....(29)

- 28 "Body gray with a white milky luster, specially the pleura and pectus. Legs tawny, femora and tibiae with irregular piceous bands, tarsi piceous. Length 2.5mm. Hudson Bay Ter." This is a synonym of *vittatum* Zett. according to Mr Coquillett (1898).....*d e c o r u m*
 Thorax fuscous or cinereous pollinose, humeri pallid, pleura pale cinereous, scutellum pale at the tip; abdomen blackish; fore coxae pale, middle and hind ones cinereous; femora pale at the base, black at tip; tibiae black. Length 3mm. Mexican species.....*c i n e r e u m*
- 29 Abdomen somewhat shining, yellowish gray or whitish at the sides, and yellow at the base; legs brown, tibiae and fore coxae white, tip of tibiae and all tarsi black. European species, also occurring in Greenland.....*r e p t a n s*
 Basal segments of abdomen opaque, distal four segments somewhat shining black or brown. Two long hairs at the tip of the first and third fore tarsal joints.....(30)
- 30 Legs reddish yellow, tarsi black, except proximal half of middle and hind metatarsi which are light yellow. Length 2mm. (St Vincent island) This is a synonym of *p u l c h r u m* Phil. according to Hunter.....*t a r s a l e*
 Legs black, base of tibiae, first joint of middle and hind tarsi and sometimes base of femora yellow; extensor surface of all the tibiae more or less whitish. A widely distributed and variable species.....*v e n u s t u m*
- 31 Length 1.5mm. Front and middle femora and tibiae wholly yellow; hind ones, except apices, also yellow. (Colorado).*g r i s e u m*
 Length 2.5mm. Legs brownish black, distal part of femora, base of tibia, and greater part of metatarsi light yellow. (California)*a r g u s*

Some of the characters used in this table have been taken from the key given in United States Department of Agriculture, division of entomology, Bulletin 10, new series, 1898, page 68, by Mr Coquillett. In the table given above, I have included all the North American species. For the southwestern and Mexican species it should however be used with caution as I did not have specimens of some of these.

Descriptions of the species

S. argus Williston

N. Am. Fauna, No. 7. May 1893. p.253. Cal. (Syn. of *S. vittatum* Zett. according to Coquillett, Harriman Exp. 1900. p.393)

Female. Black, the legs in part light yellow; front black, opaque; face cinereous, with whitish pubescence; antennae brownish black, the basal joint yellowish; thorax black, the

dorsum thinly pollinose; not shining; pleura densely white pollinose with a black spot; abdomen opaque velvety black, the first three segments with a narrow silvery white spot on either side at the hind margin, the next three segments similarly marked, but the interval between the spots successively wider, and each with two other, successively larger, white spots, leaving a black space in the middle and a narrower one at the outer sides; venter white; legs brownish black, the distal part of the femora, base of tibiae, and the greater part of metatarsi light yellow; wings pure hyaline, the veins light colored, those posteriorly very delicate. Length 2.5mm.

One specimen, Argus mountains, Cal. May 1891.

Coquillett makes this a synonym of *vittatum* Zett., though nothing is said above of the handsomely marked thorax so conspicuous in the female of *vittatum*.

S. bracteatum Coquillett

Dep't Agric. Div. Ent. Bul. 10, n. s. 1898. p.69. Mass., Cal., N. Y., Kan., Mich.

Female. Dorsum of abdomen deep black, not marked with gray, quite densely clothed with nearly erect yellowish tomentum; mesonotum also deep black and covered with appressed golden yellow tomentum; pleura grayish black; legs nearly bare, yellow, apices of femora and of tibiae, and whole of tarsi except the basal five sixths of the first joint of the hind ones on brown; first joint of front tarsi scarcely dilated, the first joint of the hind ones one half as wide as their tibiae; head gray, covered with a pale yellow tomentum; antennae black, the two basal joints yellow, mouth parts black; wings hyaline, costal, first three veins and first section of the fourth, yellow, the remainder subhyaline. Length 1.5mm.

Cambridge Mass. (May 31, 1889) and Los Angeles county, Cal. Two females, the one from California captured by the writer.

Male. Mesonotum wholly velvet black; abdomen with a gray spot on the sides of the second, fifth, sixth and seventh segments; legs almost wholly brown, otherwise as in the female. Two male specimens taken with the female.

Some female specimens believed to be this species received from Professor Aldrich, and a single specimen caught on a window in Ithaca, Oct. 16, by the writer agree perfectly with Mr Coquillett's description excepting that the abdomen of these

specimens has two longitudinal rows of small spots which are not covered by the yellow tomentum. This was particularly noticeable in the fresh specimen, but, as drying caused shrinkage of the abdomen, the spots are no longer so distinct.

The fore tibiae are each provided with a single spur, the middle and hind ones each with a pair. The tarsal claws are each provided with a large basal tooth or lobe [pl.38, fig.15]. The halteres are pale yellow.

Cambridge Mass. and Los Angeles Cal. (Coquillett, 1898); Lawrence Kan. and Battle Creek Mich. (Collected by Professor Aldrich); Ithaca N. Y.

S. cinereum Bellardi

Saggio di ditterologia Messiana. 1859. 1:13

Male and female. Gray, antennae black, first joint pale. Thorax fuscous and gray pollinose, the humeri pale; pleura light gray; scutellum pale at the tip; halteres white. Abdomen blackish. The front coxae pale, the middle and hind pair grayish brown; the femora pale at the base, their tips black; tibiae black, their middle section pale; front tarsi wholly black, the middle and hind pair with the bases of first and second joints pale. Wings hyaline. Length of body 3mm; with extended wings 9mm.

Mexico, California (Townsend, 1893).

S. decorum Walker

List of Diptera. Brit. Mus. 1848. p.112

Cinereum, argenteo micans, antennis piceis, pedibus fulvis, femoribus tibiisque piceo fasciatis, tibiis posticis tarsisque posterioribus basi albis, alis limpidis. Body gray, adorned with white milky luster, specially on the sides of the chest and on the breast; feelers piceous; legs tawny; thighs and shanks with irregular piceous bands; feet piceous; fore thighs adorned with white luster; hind shanks and four hinder feet white at the base; wings colorless; fore border veins pale tawny; the other veins still paler and very indistinct; poisers pale yellow. Length of the body 2.5mm; of the wings 6.5mm.

St Martin's falls, Albany river, Hudson bay. Presented by Mr G. Barnston.

According to Mr Coquillett,¹ *d e c o r u m* is a synonym of *S. vittatum* Zett.

¹U. S. Dep't Agric. Bul. 10, n. s. 1898.

In the report of the Minnesota Experiment Station, Bulletin 48, 1896, page 202, is given a figure of a female fly which is said to be *S. decorum*. In this figure the thorax is represented as unicolored, the abdomen with the anterior half of the second segment, a semicircular spot on the anterior margin of the segments 3, 4 and 5, a blotch on the sixth, and all of the remaining segments dark; legs dark, excepting the middle section of all the tibiae, a part of the middle and hind femora, and the basal two thirds of the hind metatarsi. No description is given, but the author stated that this fly occurs in large numbers in Minnesota during June and July. Some specimens kindly lent by Mr Washburn from the Minnesota Experiment Station Collection, bearing the label *S. decorum* proved to be *S. vittatum* (♀).

S. fulvum Coquillett

U. S. Nat. Mus. Proc. 25:96

Eight female specimens received from Professor Aldrich of Moscow Id. which I have examined, agree pretty well with Walker's description of *ochraceum*, excepting that in no case is there a trace of black at tip of femora, the tarsi are only slightly darker than the tibiae, and not black, and the length, which according to Walker is 2mm, is nearly double that in these specimens. The description of the Idaho specimens is as follows:

Deep yellow or ochraceous; the head, upper surface of antennae particularly at the incisures and the two basal joints, the mouth parts, sides of thorax at the base of the wing, the abdomen except the basal segments the tips of the tibiae and all the tarsi, particularly the fore and middle pair, and their flexor surfaces, and the hind metatarsi, more dusky than elsewhere. In fact, in some specimens the tarsi and the abdomen may be described as blackish. The head, dorsum of thorax and abdomen are covered with short, sparse, pale yellowish pile. Legs are without long hair; all tibiae with spurs; the tarsal claws simple. Halteres dusky yellow. Wings hyaline, slightly blackish at tip, subcostal cell yellow, the veins yellow except the apical half of the veins of the anterior margin, which are blackish. A yellow cloud follows the course of the media and the anal veins, as in pl.34, fig.1, of *hirtipes*. Venation as in *hirtipes*, the vein R_{2+3} being present; but M_{1+2} bends down into cell M_{1+2} slightly more than in the wing just mentioned. Length 3.5 to 4mm. Length of one wing 5mm. Ac-

cording to Mr Coquillett the species also occurs in Colorado and Montana [pl.38, fig.21].

Moscow Id. (June 19).

S. glaucum Coquillett

U. S. Nat. Mus. Proc. 1902. 25:97

Male. Head and body black, face gray pruinose, thorax bluish gray pruinose, mesonotum marked with a narrow median and slightly wider lateral black vittae, broad lateral margins, when viewed from behind silvery white, a pair of large subquadrate spots on the front end separated by the median black vitta, which is here greatly dilated; abdomen velvet black, sides of segments two and five to nine silvery, middle of dorsum of four also silvery; venter almost wholly silvery; femora and tibiae brown, bases of tibiae yellow, anterior side of front ones largely silvery; tarsi black, broad base of first joint of the middle and hind ones whitish; wings hyaline, veins along the costa yellowish brown, the others nearly hyaline; halteres yellow; length, 2.5mm.

In April. Kansas City, Missouri.

S. griseum Coquillett

Dep't Agric. Div. Ent. Bul. 10, n. s. 1898. p.69. Colorado

Female. Front and middle femora and tibiae wholly yellow, hind ones except their apexes also yellow, tarsi brown, bases of the first two joints of the middle and hind ones yellow; mesonotum grayish, indications of a darker median vitta, the sides and front corners yellow, pleura light gray, scutellum yellow; abdomen gray, segments 2 to 6 each marked with three velvet-black spots; wings hyaline, the costa, first three veins, and first section of the fourth, yellow, the others subhyaline; face and front light gray, antennae brown, the two basal joints yellow, palpi black, proboscis yellowish. Length 1.5mm. Colorado. Three females, collected by Mr Carl F. Baker.

Male. Center of mesonotum with a narrow black vitta, mesonotum elsewhere gray, dorsum of abdomen velvet-black, the second and seventh segments and a spot on the sides of the eighth, silvery gray, otherwise as in the female. A male taken with the female specimens.

S. hirtipes Fries

Obs. entomol. Pars 1. Monogr. Simuliar. 1824. 17:5, Tfl. 1, f.1.

1830 *rufipes* Meigen, Syst. Besch. 6:311-17

1830 *hirtipes* Fries, Meigen, Syst. Besch. 6:312-18

1850 *hirtipes* Fries, Zetterstedt, Dipt. Scand. 9:3426-28

Male. Black. Eyes contiguous, upper facets larger than the lower; antennae brownish black, including the two rather elongate basal joints, sparsely covered with short grayish white pile; palpi black, hairy, four jointed, the second joint rather wide and flattened. Thorax black, unstriped, the dorsum sparsely covered with an appressed, golden yellow pile, mixed with some black hairs; the scutellum black, with a tuft of long, nearly erect yellow hairs on each side; metanotum black, nearly bare; pleurae brownish black, bare and subshining.

Abdomen black, the basal half of each segment velvet-black, the apical half of each segment (sometimes only the margin) subshining, brownish black, everywhere thinly covered with an appressed pile of yellowish brown and black hairs, the yellow hairs visible only in certain lights, so that both thorax and abdomen appear black. On each side on the leaflike posterior margin of the first abdominal segment is a fringe of long, dark brown hairs. Legs brown to brownish black, including the coxae; the tarsi are usually slightly darker; anterior tibiae with one spur, middle and hind tibiae each with a pair; the legs, particularly the posterior ones, densely covered with pale brown or yellowish hairs, posterior metatarsi as long as the following four joints taken together, wider than the tibia, flattened laterally; all tarsal claws tridentate. Halteres entirely black. Wings brownish yellow tinged, and usually both branches of media, and the first and second anal veins brown clouded. This is most apparent in a balsam-mounted wing. The radius is three branched [see figure]. Length of dried specimens 3.5 to 4.5mm.

Female. Black, everywhere thickly covered with golden yellow, appressed pile, so that the fly appears somewhat yellowish. Eyes separated, the front black with appressed yellow pile; antennae brownish black, the first two joints paler, sparsely covered with short, appressed pale yellow pile, and a few scattered black hairs; palpi dark brown, the mouth parts reddish brown with black tips. Dorsum of thorax black, unstriped, thickly covered with golden yellow, appressed pile; scutellum black, with a tuft of long, nearly erect yellow hairs at the sides, metanotum subshining, brownish black, bare; pleurae brownish black, bare, and subshining. Abdomen black, when viewed from behind the posterior margins of the segments often appear yellowish white; wholly covered with yellow appressed pile. On the sides of the leaflike, posterior margin of the first abdominal segment is a fringe of long yellow hairs. The coxae are black; legs yellow, the knees, the tips of the tibiae and all the tarsal joints slightly darker, the anterior tarsi specially, sometimes brown; hind metatarsi elongate and flattened, though not so

wide as in the male. Anterior tibiae each with one spur, middle and hind tibiae each with a pair. The tarsal claws are simple; wings as in the male, though the media and anal veins are unaccompanied by the brownish cloud. Halteres fuscous, peduncle slightly paler. Length of dried specimens 3.5 to 4.5mm; wing, 3.5 to 4.5mm.

Described from many bred and captured specimens, from Coy glen, Ithaca N. Y., May 1901, and Adirondack mountains, June 1901, Moscow, Spaulding and Peck, Id.; from Professor Aldrich.

I have compared this with European specimens, and find that they agree in every particular excepting that the foreign specimens I have are a little smaller. A number of female specimens collected by Messrs McGillivray and Houghton on Mt Seward in the Adirondacks, agree perfectly even in size with those from Europe. According to the testimony of the gentlemen named, these flies are most persistent biters. Those found around Ithaca are known to annoy horses, and also have been caught biting human beings.

Larvae. In this State they are found in the latter part of April and the first two weeks of May; most of them pupating before the middle of May; the adults appearing eight or nine days after pupation. Some adults appear as early as May 1. The head of the larva is quadrangular, of a rich brown color, the posterior margin nearly black, with a black, divided eye spot on each side. The antennae are slender, first joint occupies about two thirds the whole length, the third joint being pointed, and but little longer than wide [pl. 34, fig. 5]. The fans have 30 to 50 scythe-shaped rays, each with a row of fine cilia on the inner side, at regular intervals with a longer and stouter seta [pl. 34, fig. 8]. The mandibles are stout, with the usual teeth, the apical ones being black, the others paler. The large one most remote from the apex is not so differentiated as with other species. The pair of apical bristles is partly hidden by the hair at apex. The maxillae are wider than long; the palpus being only about twice as long as broad. At the base of the palpus is a tuft of fine setae, and covering it are a few slender bristles [pl.34, fig.3]. The labium has seven apical teeth, all but the outer ones being trifid; on its ventral surface are two rows of five bristles each [pl.34, fig.4]. The labium and hypopharynx as in the other species. The dorsal surface of the thoracic segments is of a dirty yellow color, the ventral surface is nearly

white. On each side is a triangular shaped spot which marks the position of the future respiratory filaments of the pupa. The basal half of the thoracic proleg is fuscous, its apex paler. Extending from the base of the proleg to the first abdominal segment is a broad, dark line with sinous margins. The abdomen is fuscous, paler at the sutures and on the ventral surface. The underside of the last two or three segments is nearly white. The hooks (about 100 rows, 12 in a row) forming the margin of the sucker are dark brown [pl.34, fig.11-12]. In some specimens a fine fuscous line extends the whole length of the ventral surface on the median line. Just before pupation the developing ventral hooks of the pupa become visible. Though retracted in nearly all the material studied, I have found that the blood gills of the last abdominal segment consist of three unbranched lobes.

Pupa [pl.34, fig.10]. Rich brown in color; the two tufts of thoracic respiratory filaments (one tuft on each side) are each divided primarily near the base into four main branches, the two inner ones larger than the outer ones, each branch again dividing two or three times into twigs, so that upward of 60 filaments may be counted. On the ventral surface close to the posterior margin of the last six abdominal segments are four larger upward curved spines; on the dorsal surface near the base of each abdominal segment is a close row of spines projecting caudad, and on the dorsal and lateral surface of these segments, a short distance from the margin, is a row of fine spines projecting cephalad. The last named are not quite so close to the margin, nor are they nearly as large. In the figure the segments are contracted, and the caudad projecting spines appear to be attached to the posterior margin, whereas they belong to the middle of the dorsal surface of the following segment. At the apex of the last segment are two stout hooks projecting dorsad and cephalad. The pupal cases consist of a dark matted mass of silk, of no definite form, secreted on the rock, and in which the pupae are partially imbedded. The pupal life lasts about eight or nine days.

From Professor Kellogg (Leland Stanford Jr University, Cal.) I received specimens of larvae and pupae which agree very closely with those just described. These specimens (collected on the university campus) appear to differ only in that the labium of the larvae possesses but three bristles in each row on the ventral surface. Specimens from Professor Aldrich (Idaho) are identical with those from New York State.

S. invenustum Walker

List of Diptera. Brit. Mus. 1848

Nigrum, cinereo subfuscum, abdomine basi fulvo hirto, antennis piecis, pedibus fulvis, alis limpidis. Fem.; *Cinereum, antennis nigris, pedibus rufo-cinereis, tarsis nigris.*

Body black, overspread with a grayish bloom; base of the abdomen clothed with tawny hairs; feelers piceous; legs tawny and clothed with tawny hairs; wings colorless; fore border veins brown; the other veins tawny and slender; poisers piceous. Female. Body gray; feelers black; legs reddish gray; feet black.

Length of the body 3mm; of the wings 7mm.

St Martin's falls, Albany river, Hudson bay. Presented by Mr G. Barnston. This is said by Mr D. W. Coquillett to be the species which C. V. Riley called *pecuarum*.

S. irritatum Lugger

Minn. Agric. Exp. Sta. Bul. 48. 1896. p.204

Figures are given of both male and female in the bulletin, but without description. Neither is its life history given, though it was apparently known to Mr Lugger. Both the male and female are represented with an unstriped thorax, a fasciate abdomen, and bicolored legs. The male appears to have a light spot on the anterior margin of each segment of the abdomen and a pair of spots on the anterior margin of the thorax. This species is said to be the most common black fly in the central part of Minnesota.

It is to be hoped that this species may again be found and fully described in the near future.

S. metallicum Bellardi

Saggio, etc. 1859. 1:14

Male. Metallic blue black. The base of the antennae, the halteres, the fore femora, the middle portions of the fore tibiae, the bases of the middle and hind tibiae, the bases of the first and second joints of the middle and hind tarsi, are white. Wings hyaline; its veins rather indistinct. Length of body 2mm; extended wings 5mm. Mexico.

S. meridionale Riley

Dep't Agric. An. Rep't for 1886. 1887. p.512 (turkey gnat) 1891; *S. occidentale* Townsend, Psyche, July 1891, p.107 (synonymy according to Coquillett).

Female. Length 2.5mm to 3mm. Head uniform slate-blue, verging to greenish, or cerulean blue in some lights, clothed with silvery pubescence, which becomes longer behind the eyes; parts below the antennae and trophi more densely pubescent, producing the effect of a white face; eyes with a metallic coppery luster; antennae black with very dense white pubescence; no bristles on basal two joints, which are but very slightly tinged with red; joint 1 shortest; joints 2, 3, and 11, subequal in length; joint 3 widest; joints 4 to 9 subequal in length; joint 10 but slightly shorter than joint 11, which is fusiform; joints 3 to 11 gradually decreasing in width. Maxillary palpi as long as antennae, blackish, with long, whitish bristles. Thorax slate-blue, with less dense, silvery white pubescence; markings quite distinct, producing the effect of a sculpture, and consisting of three black longitudinal lines, the median narrow, widening a little at the apex, and the outer one curving inward at base, and outward at apex, sometimes reaching to base of patagium, which appears whitish on account of the dense pubescence; on the lateral edges of prothorax are fine black sutures; underside uniform slate-blue, with sparse pubescence; space around the large stigma almost white. Halteres white, very faintly tinged with red. Abdomen nine jointed, joints subequal in length, except the last two, which decrease; markings entirely different from those of *S. p e c u a r u m*, formed by velvety black, dark blue and bluish white, almost silvery, colors; the dark blue appears on dorsal surface of the last five segments, spreading from a roundish median spot, on 5 to the immaculate blue of the last two segments; segments 2, 3, and 4 have each a black cross-bar, and 5, 6, and 7, two narrow, black submedian stripes, which disappear almost entirely on 7; the bluish white forms an outer edge to all the black and extends over the whole lower surface of the abdomen, with the exception of more or less well marked black cross lines in middle of each segment; a bluish white or silvery pubescence covers the entire abdomen, but is very sparse on the dorsal parts. Legs brownish black; tarsi almost black, and more or less densely covered with white hairs. Wings, subhyaline. Veins bluish white, base ferruginous. Described from many bred and captured specimens.

Male. Length 1.5mm to 2mm. Very different in appearance from female. Eyes confluent, very large, brilliant coppery; a very marked difference in the size of the facets, those on upper surface being very large and metallic copper, those below and surrounding trophi becoming suddenly small, black, with bronze reflections; trophi reddish black, dwarfed; antennae black, with light, yellowish brown pubescence in front. Thorax above in-

dense black, velvety with a bluish luster; underside grayish. Legs reddish with black tarsi. Wing hyaline, veins and base bluish white. Abdomen; above, black with posterior margins of segments edged with gray; undersides of segments 2 and 3 light, reddish gray, the others blackish, with gray posterior margins. Sexual organs black. Thorax and abdomen very sparsely clothed with white pubescence. Described from three bred specimens.

Larva. Length when full grown 5.5mm to 7mm. Normal shape and general appearance differ from *S. peculiarum* by the much more irregular markings of segments and head. A majority of the larvae possess one or two lateral spots on club-shaped posterior third of body. Head lacks the regular arrangement of spots and lines, which become confused; the two black spots on each side present. Antennae uniformly pale, much longer than in *peculiarum*, slender and three jointed; first joint almost twice as long as joints 2 and 3 together, and a little bent; at base three times and at tip twice as thick as second joint, which is nearly uniform in width, tapering but very slightly toward the tip; joint 3 small and pointed, about one fifth as long as joint 2. Mentum similar to that of *S. peculiarum*, but distinguished by a flatter apex, by the possession of three erect bristles on each side, starting from round pores, which decrease in size toward base; a fourth very small bristle close to base, and in line with the bristles above; the sides of mentum have on each side four sharp teeth. Labrum and labium not different from those of *peculiarum*. Mandibles possess but seven teeth in the first row; the three first nearly uniform in length; teeth 4 to 7 gradually decrease in length; tooth 4 much the longest of all; the two teeth in the second row similar to those of *peculiarum*. Maxillae and maxillary palpus also similar. Fans similar, but the hairs lining the inside of the scythe-shaped rays are thicker and nearer together. Prolegs, more slender, last joint bearing a crown of hooks, usually bent suddenly toward head. Tip of abdomen similar to that of *peculiarum*. Breathing organs quite different; the three main trunks branch each six times, and the branches enter the trunk from both sides. Full grown larvae show also the newly formed, coiled breathing tubes of the pupae through their skin. Described from many specimens.

Pupa. Average length 3.5mm; shape and colorations as in *S. peculiarum*. The thoracic filaments consist only of the six original rays, which do not branch. On dorsal surface of the posterior margins of abdominal joints 4 and 5 is a row of eight anteriorly curved hooks, similar to those of *peculiarum*, but

none on joint 3; anterior margin of joint 9, and of subjoint with a continuous row of smaller, anteriorly curved hooks; joints 7 and 8 unarmed dorsally; ventrally joints 6, 7 and 8 have each four minor hooks.

Cocoon. Length 3.5mm. Neater than that of any other species known to me, being formed of fine threads, lined with gelatinous ones. The web is quite dense, uniform, with well defined, sometimes thickened ribs. The cocoon is always securely fastened singly to leaf or stick, and if many are fastened on the same leaf, they do not crowd each other. It fits snugly about the pupa, which is so securely anchored inside as to be with difficulty extricated.

Several female specimens taken by Messrs MacGillivray and Houghton at Axton N. Y. in company with *S. vittatum* agree perfectly with Coquillett's description, though not so well with Riley's. Coquillett's description of the female in United States Dep't Agric. bulletin 10, new series, reads as follows:

Abdomen of female gray, marked with a velvet-black fascia on segments 3 and 4, and sometimes with two subdorsal spots of the same color on 2, 5 and 6; thorax bluish gray with three black vittae.

The blue color on the abdomen spoken of by Riley in his description is not distinguishable in the dried cotype specimen, the posterior segments appearing grayish. In the male the thorax is velvety black, with a few pale yellow hairs, specially anteriorly and posteriorly. The abdomen is velvet-black, the posterior margins of segments sometimes pale. The fore tibia possesses a single spur, the middle and hind ones each with a pair [pl.38, fig.12]. All tarsal claws of the male trifid [pl.38, fig.18]; of the female bifid [pl.38, fig.16].

It may be mentioned that what Riley calls mentum I have termed labium. To Riley's description of the larvae may be added that the apical pair of bristles of the mandible is not present or at least is not differentiated from the other hairs; the labrum and hypopharynx [pl. 33, fig.11, 3] resemble those of other species; the labium has four pairs of setae [pl.33, fig.4], one of which is quite small; the maxillary palpus has no setae on the last joint, and but few hairs on the basal joint. No spines are apparent at tip of the last abdominal joint of pupae,

the other spines and hooks are as described by Riley. This species has been reported from New York. I have also seen specimens from Moscow and Albion Id., Lawrence Kan. and Axton N. Y.; those from Idaho and Kansas belonging to Professor Aldrich.

S. mexicanum Bellardi

Saggio etc. Apx. 6. 1862

Male. Black. Head black, front prominent, triangular, with whitish reflection; antennae black, first joint and base of second yellow; face prominent, black, the epistome yellowish, with grayish reflection; palpi black, paler at the base; thorax wide, subquadrate, slightly convex, black, with a grayish reflection, with yellow pile? (aureo-squamuloso); humeri pale; pleurae black, anteriorly and posteriorly with fuscous spots; scutellum fuscous; the halteres white; abdomen black, the base of the second segment pale yellowish, the second, third, fourth and fifth pale yellowish on the sides; fore and middle coxae wholly yellow, hind ones fuscous with yellow tips; fore femora wholly yellow, the middle and hind pairs fuscous black, at base and tip yellow; all tibiae fuscous-black with yellow bases; fore tarsi wholly black; middle tarsi black, with bases of all the joints yellow; hind tarsi black with base of first joint widely and second joint narrowly yellow; wings hyaline iridescent. Length 4mm; extended wings 9mm.

Mexico.

S. minutum Lugger

(= *S. vittatum* Zett.)

Minn. Agric. Exp. Sta. Bul. 48. 1896. p.202.

The bulletin mentioned above contains a figure of the female of a species which is said to be common near Minneapolis from May 15 to June 1. No description is given excepting the statement that it is very small. The figure represents a fly with an unstriped thorax, the abdomen with a dark fascia on each segment, the fascia covering nearly the entire dorsal surface of each segment, excepting the narrow basal and lateral margins. Its legs are bicolored. Specimens bearing the label *S. minutum* received for study from Mr Washburn proved to be *S. vittatum* Zett.

S. occidentale Townsend

Psyche. 1891

Female. Cinereous; abdomen light fulvous. Head cinereous, eyes black; face cinereous, raised and somewhat darker in the center, sparsely clothed with fine silvery hairs; front cinereous,

widened below into a crossbar, a prong invading the orbital area on each side; silvery pubescent on occipital margin; proboscis black, brownish at the tip, palpi black; antennae cinereous, with short silvery pubescence, the two basal joints longer than the following joints, which are nearly equal in length; occiput cinereous with silvery pubescence around the margin.

Thorax cinereous, mesoscutum entirely covered with silvery pubescence, with two dorsal lines and usually a fainter median line between them; pleurae fulvous posteriorly, scutellum black, silvery pubescent. Abdomen light fulvous sparsely covered with short silver pubescence. Second, third and fourth segments above with a brown cross band shading to darker on the sides and in the middle, particularly on the third and fourth segments, remaining segments with a broad, median, dorsal, cinereous band, bounded laterally on fifth, sixth and seventh segments by a curved more or less faint line of brown; venter light fulvous, silvery pubescent. Legs black, silvery pubescent. Wings hyaline, iridescent by reflected lights; halteres white. Length of body 2mm; of the wings 2mm.

Described from many fresh specimens. This species is smaller than either *S. peculiarum*, or *S. meridionale*. *S. metallicum* Bell. from Mexico is given as 2mm long, but the male is described. The female would be much larger.

I have examined specimens from New Mexico, kindly sent me by Professor Aldrich of Idaho, to whom the specimens were sent by Mr Townsend, and named *occidentale*. The only difference I have been able to discover between this and *meridionale* is its smaller average size. The tarsal claws are as in *meridionale*. The abdominal markings were too indistinct, owing to shrinkage, to allow of comparison. For the present I regard it as a small variety of *meridionale*.

S. ochraceum Walker

Ent. Soc. Lond. Trans. 5:332

Female. Testaceous, with white tomentum; head white; antennae testaceous; thorax ochraceous, with two white stripes; abdomen blackish, testaceous at the base; femora and tibiae with black tips; tarsi black, testaceous toward the base; wings vitreous; veins pale testaceous. Length of body 2mm; of wings $4\frac{1}{2}$ mm. Mexico.

This species can hardly be the female of *S. metallicum* Bellardi.

S. pecuarum Riley

U. S. Dep't Agric. Rep't for 1886. 1887. p.512 (Coquillett considers this a synonym of *S. invenustum* Walker)

Plate 33, fig.6-11

Female. Length 2.5mm to 4mm. Head uniform grayish slate, clothed with short yellowish hair, which becomes longer behind the eyes; eyes black, with coppery or brassy reflections; antennae black, with whitish pubescence, and with a few bristles on two basal joints, which are tinged with red, joints 1 to 11 gradually diminishing in thickness toward the last, joint 1 the shortest, joints 2 and 3 twice as long as joint 1, joints 4, 5 and 6 as long as joint 1, joints 7, 8, 9 and 10 gradually increasing in length, last joint fusiform, twice as long as joint 10. Maxillary palpi a little longer than the antennae, blackish, with long grayish bristles.

Thorax grayish slate, more or less densely covered with short, yellow hairs, and with usually very distinct markings, consisting of two median dorsal, and two subdorsal broad, longitudinal, sooty black bands, of which the latter curve to posterior edge of patagium, which is reddish at tip; lateral edges of prothorax with fine black sutures; underside of the thorax uniform grayish slate, with sparse yellow hairs, space around the one large stigma lighter; halteres opaque, reddish white; legs uniform reddish brown, densely covered with yellowish hairs; tips of the tarsi blackish; wings subhyaline; larger veins and base reddish brown.

Abdomen nine jointed; joints subequal in length except the last two, which decrease in length; a longitudinal, broad, bluish gray dorsal band extends from near the base of second segment, where it is broadest, to the tip curving downward to the anterior lateral edge of seventh segment; below this band laterally the color is blackish brown, with the exception of a broad bluish gray transverse band on the posterior edge of each of the segments from 1 to 6; underside of abdomen uniform brownish gray, without markings; abdomen densely covered with yellowish hair, which is very long upon the posterior edge of segment 1, forming an overlapping fringe.

Male. Length 1.5 to 2.2mm; differs considerably from the female. Head not visible from above, being occupied by the very large confluent eyes; the remaining parts below the eyes are black, with black hairs and bristles; eyes composed of two different kinds of facets, those above very large, twice as large as those of female, and those in front and surrounding the dwarfed trophi very minute, the dividing line between the sizes being abrupt; antenna similar to the female, more pro-

nounced in color, both the black and reddish being more vivid; maxillary palpi black, and shorter than the antennae. Thorax black above with sparse yellow hairs; legs somewhat lighter in color, tip of the tarsi not black; hairs upon the legs longer than those of the female. Wings hyaline, veins and base yellowish brown. Abdomen black with grayish white posterior margins to the segments dorsally and laterally, and covered with longer yellowish hair. Described from two bred specimens.

Larva. Average length when full grown 7mm to 8mm, sub-cylindric, the club-shaped posterior third of body being twice as stout as the thoracic joints, and joint 4 the most constricted. Translucent when living, dirty white in alcohol. Immaculate in a very few specimens; distinctly marked in the great majority with brownish dorsal cross bands in middle of joints, leaving free a white mediodorsal longitudinal line. Thoracic joints with three irregular rings of the same color; underside more or less irregularly spotted with brown. Head subquadrate, horny, yellowish brown, with a number of brown spots and lines in regular order, and two roundish, approximate ocellate, black dots on each side under the skin, and seemingly rudimentary organs of sight, from which the future eyes originate. Antennae uniformly pale, three jointed, about one third as long as greatest width of the head; joint 1 very stout, fully four times as thick as 2, which is a little longer than 1, straight, slightly tapering toward the tip. Joint 3 extremely small, a mere triangular tip; mentum subtriangular, with apex cut away, and replaced by three groups of very small teeth, of which the central group consists of three teeth, the middle one largest; and the groups on sides, of four teeth, of which the second from center is largest. Sides of mentum, near the apex, with two small teeth each; all the teeth are chitinous and black; a long erect bristle, pointing upward and inward, near each side of mentum; labrum horny, densely covered with hair; mandibles resembling in shape the profile of the inverted last joint of the human thumb, with a series of teeth in place of the nail. Teeth difficult to see, owing to the presence of five distinct brushes of hair; on extreme lower tip of mandibles three large teeth; below them a series of 11 slender and very pointed teeth, of which the first two are the smallest, teeth 3 to 9 increasing and teeth 10 and 11 decreasing gradually in length; a second series of teeth below them consists of two triangular teeth, of which the first is largest. Maxilla stout, fleshy, with an internal thumb-shaped lobe; maxillary palpus two jointed, first joint cylindric; second very short, crowned with a regular circular row of short spines or warts; labium

horny with two brushes of hair above, between which is a very small ligula, covered with a small brush of hairs. Fans, composed of stout stem, bearing about 46 scythe-shaped rays, lined on the inside by very minute, equidistant, erect hairs of equal length. Thoracic proleg, faintly four jointed, subconical, retractile (introversible), very thin and transparent, crowned with about 20 rows of short, sharp hooks, apparently arranged in a circular manner; the hooks, of which 10 are in each row, seem to be movable to a certain extent, and are fastened or hinged to small chitinous rods in the epidermis. Tip of abdomen formed by a subcylindric body crowned with rows of hooks. Breathing organs below these hooks and on the upper side of abdomen; they consist of three short, cylindric, soft and retractile tentacles, which connect with large internal tracheae. In full grown larvae a spot more or less dark is seen on each side of thoracic joint; it is produced by the formation of the coiled breathing tubes of the future pupa.

Pupa. General color when fresh, honey-yellow; prothoracic filaments brown, and the abdomen dorsally also tinged with brown, except a mediodorsal space. All the members have also a fine brown marginal line; prothoracic filaments consisting of six main rays, issuing from the basal prominence and subdivided two or three times, so that in most cases as many as 48 terminal filaments can be counted. Abdominal joints three, four, and five, each with eight well separated, dark brown and anteriorly recurved hooks. The four on each side separated by a mediodorsal space; those on joint 3 less conspicuous than those on joints 4 and 5; joint 6 without armature; joints 7, 8 and 9, and also subjoint less distinctly armed near anterior margin with a continuous dorsal row of very minute posteriorly recurved points; ventrally joints 6, 7, and 8 have each four very minute anteriorly recurved hooks.

Cocoon. Average length 3.5mm. Not completely made and not entirely covering the pupa, but tightly surrounding its larger portion. Shape very irregular, with no distinct rim at the upper edge, which is more or less ragged. The threads composing it are very coarse, and the meshes rather open and ordinarily filled with mud. Not always fastened separately to objects, but frequently crowded together without forming, however, such corallike aggregations as in some of the northern species.

That part which Riley called the labium in the above description, appears to be a combination of labium proper and the hypopharynx. Often in dissection these two parts stick together and appear as one, but with a little care the hypo-

pharynx can always be removed entire. To the above description I may add that the apical pair of bristles of the mandibles [fig. 6] are present, though slender, the labrum and hypopharynx [fig. 7] as in other species; the labium [fig. 8] has the middle tooth trifid, and there are three setae (instead of one, as Riley has it) in each row on the ventral side. The maxillary palpi have a few slender setae and there are also a few on the basal joint [fig. 9].

I find eight abdominal segments plus the anal segment in the pupa [fig. 10], and not nine, as Riley has it. Therefore the eight hooks are on each of segments 2, 3 and 4, and not 3, 4 and 5. Dorsally, on each of segments 5, 6 and 9 is a transverse row of minute caudad projecting spines; 7 and 8 with slightly larger ones. Ventrally, segments 5, 6 and 7 each with four large spines curved cephalad. In the Cornell University collection are four specimens of adults, two males and two females, obtained from Riley.

S. pictipes Hagen

Bost. Soc. Nat. Hist. Proc. 1880. 20:305

1895 *S. innoxium* Comstock, Manual for the Study of Insects

Male. Eyes very broadly contiguous, the large facets distinctly separated from the small by a horizontal line. Face small, as broad opposite the insertion of the antennae as its length, considerably narrowed below; a deep groove on either side running obliquely to the inferior angle, the median part arched; in color grayish pruinose, or in some reflections almost silvery; antennae situated at about the lower fourth in profile; in color black with a slight pruinosity; palpi black, slender, the first three joints somewhat thickened. Metanotum thinly covered with golden pubescence; in color velvet-black, the lateral margins and a spot running upward and inward from each humerus gray and yellowish gray, but somewhat variable in different reflections. Mesad of these gray humeral spots is a pair of small silvery spots. Pleurae, pectus and coxae, gray pruinose, showing in some reflections the black ground color. Abdomen with eight visible segments, in color deep velvet-black; under the leaflike margins of the first segments and the sides of the remaining segments gray, or in some reflections silvery pruinose. Legs black or dark brown, the basal part of the dilated hind metatarsal joint yellow, in some specimens the ex-

treme base of the tibiae yellowish, with a single short spur on the fore tibiae, and a pair of longer ones on middle and hind tibiae [pl.38, fig.8]. Fore and middle tarsi slender, hind ones widened, all claws trid [pl.38, fig.8, 17]. Wings hyaline or slightly tinged; the anterior veins thickened, the remainder slender [pl.36, fig.7]. Knob of halteres orange yellow. The male genital organs are short though rather complex, consisting of a pair of outer sheaths, then a pair of elongate blunt processes, within which are two pairs of hooks; the outer, shorter pair are incurved and clawlike; the longer, inner pair are slender, with some outwardly projecting hooks. Length 3.5 to 4mm.

Female. Eyes with a small deep sinus on each side, just about the base of the antennae, above which the front is a little longer than wide, and a little wider above than below. Face a little wider than the narrow part of the front, the sides parallel, its surface gently and evenly convex, clothed with white hairs; antennae tapering more than in the males, the first two joints yellowish. Basal joints of palpi stouter. Facets of eyes uniformly small, the eyes much smaller and the posterior orbits conspicuous. Thorax like the head, opaque gray pruinose. Metanotum with three slender, deep brown or black stripes, the lateral ones gently incurved back of the anterior knoblike dilation. Abdomen velvet-black, the second segment (or the part beneath the leaflike margins of the first) and the posterior margins of three following segments (except at the center), opaque gray or grayish white; the remaining segments, and leaflike sides of the first, lightly pruinose; venter gray; in some specimens with a small black or grayish triangular spot on center of the dorsum of segments 3, 4 and 5. The legs grayish, in some specimens quite pale; the tips of some or all the tibiae usually, and the tarsi nearly always, black, except the bases of hind metatarsi and sometimes the middle also, which are yellow. The tibial spurs and hind metatarsi as with the male. Tarsal claws simple [pl.38, fig.20]. Wings as with the male. Knob of halteres yellowish white. Length 3 to 4mm.

I have compared this species with Hagen's type, (larvae, pupae and adults) and find that they agree perfectly. The apparent discrepancy in comparing Hagen's description¹ with the one given above is due to the fact that Hagen described his from bottled material. His description agrees very well with alcoholic material of this very common *Ithaca* species. Hagen was in error in regard to the number of respiratory filaments of

¹Bost. Soc. Nat. Hist. Proc. 20:305.

the pupa, in stating that there were but eight; for, on examination of the Cambridge material, nine filaments were counted. Coquillett (1898) says of the male mesonotum, "usually with three black vittae"; but this I have found to be an exception rather than a rule.

Recorded from New York, Texas, California, and Moscow Id. (Collected by Aldrich).

Larva. Length 10 to 12mm. Plate 36.

The fans of this species have about 60 rays; the cilia and the regularly arranged setae on the inside of the rays are very distinct. The antennae, light brown in color, are three jointed, the second joint about one third as long as the first, the third very short and pointed, the extremities of the first and second are hyaline, the two small budlike processes at the end of the first and the second joint are brown. The mandibles possess the apical pair of bristles, the apical teeth are quite black, the others paler; the maxillary palpus with a few scattered bristles on the shaft and at the base. Labrum and hypopharynx as usual, in the latter the lateral hornlike processes are quite prominent. Labium with the toothed area rather narrow, the lateral and middle teeth elongate, the ventral surface with two rows of 10 or 11 bristles each [fig.3]. The thorax and abdomen are a deep black; paler at the incisures, and on the ventral surface, particularly toward the caudal end. A narrow black longitudinal, ventral stripe is often present. The blood gills consist of three many branched papillae.

Pupa. The two thoracic respiratory organs each consist of nine filaments; eight of which are about equal in length, the ninth arises a little lower on the shaft, and is somewhat shorter [fig.8]. On the dorsal surface of each of the segments 2, 3, 4, and 8, are eight black hooks curved cephalad, those on the second and the eighth segments being much smaller than the others. Ventrally 5, 6 and 7 each, with four double, curved hooks, on the caudal segments are two very short blunt spines, and three smaller ones on each side of 3, 4 and 5. The pupal case is of the boot-shaped type [pl.35, fig.5].

***S. pulchrum* Philippi**

Chilian Diptera. 1865. p.633

1896 *S. tarsale* Williston, Dipt. of St Vincent, p.268

Female. Abdomen black, the proximal segments opaque, the distal four segments shining. Length 2mm.

Front and face black, with a light gray reflection. Antennae yellow; the distal joints somewhat brownish. Mesonotum deep

black; in front, opaque with a silvery shimmer, and with sparse, short, curly, golden yellow tomentum; behind, shining. Pleura black, whitish pruinose. Abdomen black, the basal segments opaque, the distal four segments somewhat shining, and with a delicate whitish pruinosity. Legs reddish yellow; tarsi black, except that the proximal half of the middle and hind metatarsi is light yellow; first and third joints of the front pair each with two long hairs; second and third joints of the same pair dilated, the fourth and fifth very small; hind metatarsi elongate and stout, the following two joints a little dilated, the fourth and fifth small. Wings hyaline; veins yellow. *Williston*

Three specimens. The above synonymy is according to Hunter.

This species seems to resemble greatly *S. venustum* excepting for the color of its legs.

S. quadrivittatum Loew

Berl. Ent. Zeitschr. 1862. Centur. 2, p.186

Black opaque, the thorax with four white vittae; the halteres yellow; middle and hind tibiae and tarsi white banded; wings hyaline. Body 1.67mm; wing 1.67mm.

Black, opaque. Antennae fuscous; dorsum of the thorax with four longitudinal lines, the posterior margin whitish pollinose; scutellum spotless; the pleural spots and the metanotum whitish pollinose; the legs fuscous black; the knees and the bases of the metatarsi of the fore legs, the basal rings of the middle and hind tibiae, the metatarsi excepting the tip, and the bases of the second and third tarsal joints are white; halteres yellow; wings hyaline, the heavier veins deep yellow. Cuba.

S. reptans Linnaeus

Fauna Suec. 1803. 1761 (Synonymy according to Schiner, 2)

1767 *sericea* Linnaeus, Syst. Nat. 12:378, no. 58

1776 *erythrocephala* DeGeer, Ins. 6:161, no. 37 (*Tipula*)

1781 *reptans* L. Schrank, Enum. Ins. Austr. p.985 (*Culex*)

1804 *argyropeza* Meigen, Syst. Besch. 1:291-92

1818 *reptans* Meigen, Syst. Besch. 1:291-92

1818 *sericea* Meigen, Syst. Besch. 1:296-98

1818 *elegans* Meigen, Syst. Besch. 1:296-99

1818 *variegata* Meigen, Syst. Besch. 1:292-93

1823 *reptans* Fries, Obs. Entomol. Pars 1 Monogr. Simul. 1:13

1830 *cincta* Meigen, Syst. Besch. 6:311-14

1838 *posticata* Meigen, Syst. Besch. 7:52, 21

Male. Velvet-black; dorsum of the thorax with a silvery white margin, spotlike on the humerus, broadly interrupted in front;

visible only in certain lights. Pleura also with a whitish reflection; abdomen with silvery white spots on the second and on the last two segments, wanting in rubbed specimens; the posterior margin of the first segment with long and dense brownish cilia. Head black, face grayish white; antennae and palpi brownish black, the former more slender than is usual with the members of this genus, with whitish reflections on some parts. Legs dark brown; front coxae yellowish, fore tibiae silvery white outwardly; middle tibiae yellow at the base, hind tibiae likewise, though in less degree, light brown, with a whitish reflection; metatarsi of the hind legs yellowish at the base; the hairs of the fore and hind femora, and particularly on the extensor surface of the hind tibiae, conspicuous. Halteres bright yellow; wings purely hyaline, with delicate and transparent veins, those of the anterior margin being somewhat thicker and more conspicuous; the wing surface with a golden brown reflection; the media not petiolate. The short, scattered hair of the thorax seldom distinct, the color of the legs variable in intensity.

Female. In coloring does not resemble the male in the least. The ground color is blackish brown; the dorsum of the thorax covered with a depressed yellow pile, on the margins with a whitish reflection, on the center with a grayish reflection, the pleurae grayish white. Abdomen somewhat shining; on the sides whitish or yellowish gray; on the venter, at least at the base, in living specimens, yellow, which is continued around on the dorsum in some specimens, usually not distinct in dried specimens. Legs brown, usually paler than those of the male; the tibiae, with the exception of the tip, and the fore coxae whitish or yellowish white, the tips of the tibiae and the tarsi black, the basal half of the hind metatarsi and sometimes also the extreme base of the following joint yellowish. Front and face gray; antennae and palpi brown, the former paler at the base. In other particulars as with the male. Length 2 to 3mm. Translation from Schiner, *Fauna Austriaca*, 2:365

According to Schiner [*loc. cit.*] this is the species whose life history has been described by Fries, Westwood and Heeger. According to Schiner also, *sericea* is a synonym of *rep-tans*. Of *sericea* Westwood writes that the larva possesses three unbranched blood gills, and that the pupa has eight thoracic respiratory filaments on each side.

This European species has been reported by Lundbeck as occurring in Greenland. (*Diptera groenlandica*, 1898)

S. tamaulipense Townsend

N. Y. Ent. Soc. Jour. 1897. 5:171-72

Female. Length 1.5mm. Near *S. meridionale*, but smaller, and the outer one on each side of the three thoracic lines not curved outward at posterior end. Eyes velvet-black, face and front silvery; front with usually a trace of a linear black vitta, in one specimen very distinct, in another entirely wanting. Antennae yellowish with a silvery covering. Thorax silvery, with three longitudinal lines; middle one longest, very narrow and linear; outer ones heavier, straight, slightly divergent posteriorly. Looked at directly from above, the outer lines appear curved, outwardly convex. Scutellum and metascutum below scutellum, both brownish in some lights but in others they appear wholly silvery, the various portions appearing different in color to the view at the same time. Abdomen silvery but the third and fourth segments wholly brownish, sometimes with a round median spot on each. Legs yellowish, shaded with silvery, tarsi blackish or brownish; hind metatarsi yellowish except at distal end. Wings clear, whitish, veins dilute yellowish. Halteres and wing bases pale dilute yellowish.

Four females, Reynosa, Tamaulipas. A small species taken on the windowpane of railroad car, May 4. Described from four dried specimens. *Townsend*

S. venustum Say

Acad. Nat. Sci. Phila. Jour. 1822. 1:28 and Compl. Wr. 2:51

1862 *molestum* Harris, Ins. Inj. to Veg.1870 *piscicidium* Riley. Am. Ent. 2:367

(Synonymy according to Coquillett, 1898)

Male. Velvet-black. The eyes are very large, separated by a single line, reddish yellow, lower half black. Thorax velvet-black, a bright pearlaceous, dilated line each side before, and a large pearlaceous spot behind, sides beneath varied with pearlaceous. Abdomen with an oblique pearlaceous line at base, and two approximated lateral pearlaceous ones near the tip. Tibiae above, and first joint of four posterior tarsi white. Wings with yellow and iridescent reflections. Poisers black, capitulum bright yellow, dilated. Near Louisville Ky. at Falls of the Ohio. *Say, loc. cit.*

Superhumeral gray stripes metallic, no metallic spots between them; mesonotum not vittate with black. *Coquillett*¹

The following description of the males is based on specimens from Ithaca N. Y. and Battle Creek Mich. Velvet-black. An-

¹U. S. Dep't Agric. Bul. 10, n. s. 1898.

tennae black, covered with short whitish pile; palpi black, thorax velvety black, with an oblique bluish white metallic humeral spot, the posterior margin also metallic; scutellum velvety black; and pectus black, grayish pruinose. Abdomen deep velvety black; on each side on the margin of the first abdominal segment is a tuft of fuscous hairs, underneath which the segments appear metallic. The posterior part of the venter appears metallic. Legs, black and yellow. The extensor surface of front tibiae, and a basal ring on the middle and hind tibiae, silvery white; the fore coxae, basal half of all femora, tibiae and metatarsi, and sometimes also bases of some tarsal joints more or less yellowish; the rest black. The anterior tibia with a rudimentary spur, middle and hind pair each with two spurs; tarsal claws trifid. Halteres orange-yellow; wings whitish hyaline. Length 2 to 2.5mm.

Female. Black. Antennae black covered with short whitish pile; two basal joints usually yellowish; palpi black with pale hairs; face and front gray pollinose. Dorsum of thorax black, bluish gray pollinose, particularly on the sides and front corners, sparsely covered with very short yellow hairs. Scutellum black, with erect black bristles; pleura black, gray pollinose. Abdomen black, the anterior segments velvety, the posterior ones subshining brown. Legs yellowish, middle and hind coxae brown, tips of femora and tibiae, the whole of fore tarsi, tips of the middle and hind, first and second tarsal joints and usually the whole of the remaining joints, black. Sometimes the femora are wholly black. The extensor surface of all tibiae is silvery white. The first and third joints of the fore tarsi are each provided with a pair of long black hairs near the tip, besides the usual shorter ones. The anterior tibia with rudimentary spur, middle and hind ones each with a pair. Tarsal claws simple. Wings whitish hyaline, the heavy veins yellowish brown, quite yellowish at the base at point of attachment. Halteres pale yellow. Length 2 to 3mm.

This species is very common in the Adirondacks, where it proves to be a great annoyance to travelers. It seems to have a wide distribution, having been reported by Mr Coquillett¹ as occurring in Canada, New Hampshire, New York, Michigan, Minnesota, Wyoming, British Columbia, California, Texas, Louisiana, Mississippi and Florida. I have found it in Ithaca N. Y., and I have seen specimens from Moscow, Marsh and Albion Id., and Battle Creek Mich.

¹U. S. Dep't Agric. Bul. 10, n. s. 2. 1898.

Larva. Specimens from Wilmoth and Axton N. Y. [PL37, fig.1 to 6]. Pale brown with paler incisures; head brown, labrum hairy, with serrated edge; fans with 50 to 60 rays; mandibles with a pair of apical setae; hypopharynx as usual; labrum [fig.6] with middle tooth rather prominent, its ventral surface with five setae in each of the two rows; each of the three branches of anal papillae with a number of lobes.

Pupa. Six branched respiratory filaments; eight hooks curved cephalad on dorsum of each of abdominal segments 3 and 4; four hooks curved cephalad on ventral surface of each of segments 5, 6 and 7; a close transverse row of small caudad projecting spines on dorsum of eighth segment, and a pair of short, blunt tubercles on the anal segment. Cocoon of the wall pocket type.

S. venustum, var. a

Plate 37, fig.8-14

A number of specimens bred from larvae and pupae taken from Fall creek, Ithaca N. Y., differ in the adult stage from *venustum* as described above in being uniformly smaller (length 1.5mm); having the base of wing brownish and not yellow, and in having the last four abdominal segments of the female a shining black instead of brown. The larva differs as follows: in size averaging less than two thirds that of *venustum*, labrum with its toothed edge wider in proportion to its size than in *venustum*, its teeth more nearly of a size, the ventral setae three in each row plus a very small one. The pupa differs in having 10 respiratory filaments in each tuft, the hooks on segment 2 more distinct, and the tubercles on the anal segments apparently wanting.

S. piscicidium (Synonym of *venustum*) Riley

Am. Ent. 2:367

According to Coquillett this is a synonym of *S. venustum*; but I have larvae and pupae from Professor Needham, taken at Saranac Inn N. Y., which, though agreeing with Riley's figures of *piscicidium*, differ decidedly from the larvae and pupae of *S. venustum* taken by Messrs MacGillivray and Houghton at Axton N. Y. in 1901, and by Professor Comstock at Wilmoth N. Y. Of the adults of the Saranac Inn material I have only alcoholic specimens, hence can not state definitely wherein these differ from *S. venustum* from Axton N. Y. excepting that it averages a little larger in size. For the present I shall regard it as a variety, though in all the material

of larvae and pupae studied I did not find transitional characters. Should a difference be discovered on the examination of more fresh specimens of both varieties of adults, the specific name of *piscicidium* must be revived. Riley's description is as follows:

Female. Head velvet-black; eyes brownish; antennae with joints 1, 2, 3 and 11, subequal in length, each of the others half as long. 1 and 2 rufous, 3 to 11 inclusive black and gradually diminishing in thickness to the last, which is fusiform; palpi longer than the antennae, black. Thorax velvety black with faint fulvous pubescence above; halteres opaque and white. Abdomen nine jointed, joints equal in length except the last two, which are smaller and smaller; dorsally velvety black, laterally and ventrally, especially towards the base and at the incisures, inclining more or less to rufous. Legs with the front trochanters white or fulvous, and the middle and hind ones more dusky; the coxae all either rufous or fulvous; the femora all dark, though sometimes (two specimens) the base is paler. Front tibiae with the upper three fourths white, the rest black; hind tibiae with the upper two thirds white, the rest black; middle tibiae with about the upper one half white, the rest black; front tarsi black; middle and hind tarsi with the upper half of first joint white or rufous, the rest black. Wings subhyaline, with the veins fuliginous. Length of the body (in alcoholic specimens) .14 to .17 inch. Mumfords N. Y.—Riley

Larva [pl.37, fig.2,5,7]. Pale grayish, slightly darker dorsally. Head of the usual shape, brown with darker margins. Fans with 50 to 60 rays, the longer cilia quite prominent. The apical pair of bristles of the mandibles present; the labrum with a serrated margin; the maxillary palpus with a few setae on last joint and also on base; hypopharynx as usual; labium with the toothed margin comparatively narrow; its teeth nearly uniform in size, with seven setae in each row on the ventral surface [fig.5]. Anal papillae, three much branched lobes.

Pupa. The pupa with eight branched respiratory filaments, with four hooks curved cephalad on ventral surface of each of the segments 4, 5, 6 and 7, those on the fourth being quite small. On the dorsal surface of each of segments 3, 4, 5 and 6 are eight hooks curved cephalad, those of 5 and 6 being very small; and on the dorsal surface of 7 and 8 are a number of hooks curved caudad. The anal segment with two short, blunt spines. The pupal case is of the "wall pocket" type.

In order to obtain characters to separate the adults of the Fall creek, Saranac Inn and Axton varieties of *venustum*,

a number of them which were nearly ready to emerge were drawn from the pupal skins and examined for distinctive structural characters; but, excepting the difference in size, none were observed. With freshly bred material, perhaps specific characters might be obtained.

The larvae of *piscicidium* is briefly described by Riley in the paper just quoted.

***S. virgatum* Coquillett**

U. S. Nat. Mus. Proc. 1902. 25:97

Male. Head and body black, antennae and mouth parts dark brown, thorax gray pruinose, mesonotum marked with a narrow median and laterally with a very broad velvet-black vitta (viewed directly from above), mesonotum sparsely covered with short, appressed hairs; abdomen on first six segments opaque, velvet-black, a large silvery white spot on each side of the second and sixth segments, venter near each side with an interrupted yellow vitta on segments three to seven, composed of appressed hairs, on each side of base of abdomen is a large cluster of yellow hairs, and a smaller cluster on each side of segments three to five; femora and front tibiae yellow, their apices brown, middle tibiae brown, a yellow ring beyond the base, hind tibiae brown, the extreme base yellowish; tarsi black, broad base of first joint and extreme base of the second on the middle and hind tarsi light yellowish; wings hyaline, veins along the costa yellowish brown, the others nearly hyaline; halteres yellow.

Female. Differs from the male as follows. Vittae of mesonotum brownish, the median vitta dilated posteriorly, wider than either of the lateral ones; viewed from in front the mesonotum appears whitish pruinose and with two velvet-black vittae; abdomen on the first five segments and sides of the sixth opaque, gray pruinose, and with a velvet-black fascia at bases of three to six, broadly interrupted on six, the middle of which and the portion of the abdomen beyond it is very thinly pruinose and of a dark brown color. Length nearly 3mm. In August; Las Vegas Hot Springs, N. M.

***S. vittatum* Zetterstedt**

Ins. Lapponica. 1844. p.803

(= *S. tribulatum* Lugger)

(According to Coquillett, *decorum* Walk. 1848 and *argus* Will. 1893 are synonyms)

Female. Gray; nearly bare; dorsum of thorax with five black stripes, the median one entire, the intermediate pairs inter-

rupted, the exterior pair spotlike. Each segment of the abdomen with a black dorsal stripe and basally on each side with a black spot, the penultimate segment black. Wings whitish hyaline; halteres white; legs fuscous black, the front side of anterior tibiae, the base of the middle and hind tibiae, and the base of the middle and hind metatarsi white. Length 3mm. *Zetterstedt*

Female. The abdomen gray, bases of segments 3 to 7 or 8 marked with a velvet-black fascia produced backward in the middle and at the ends. Length 2 to 4mm. New York, Minnesota, Nebraska, Kansas, California.

Male. Hind tarsi bicolorous, mesonotum gray on sides and hind margin, center largely velvet-black; without gray streak extending inward from humerus; sides of abdominal segments 4 to 7 with silvery white hairs. *Coquillett*¹

The markings of the female of this species seem somewhat variable. The thoracic markings are usually quite distinct. The median stripe is nearly of uniform width excepting at the posterior end, where it becomes narrower; the intermediate stripes are *f* shaped, the extremities larger, the intermediate portion usually a hair line, sometimes obsolete; the exterior pair usually elongated spots. The abdominal markings are as described by Coquillett, though occasionally there are additional disconnected, velvet-black lateral spots, one on each side on segments 3, 4 and 7, and a pair on 5 and 6. Sometimes also, owing either to the contracted condition of the abdomen or to the fasciae being narrow, only the black projections of the fasciae are visible on the more posterior segments, giving the appearance of three spots on each. The legs are often gray; the femora and tibiae paler at the base, the tibiae black at tip, the tarsi deep black except basal portion of middle and hind metatarsi. Fore tibiae with one spur, middle and hind with a pair. Tarsal claws of female simple.

Some specimens from Brookings S. D., received from Professor Aldrich, and which are the males of *vittatum*, possess the following characters:

Male. Velvety black, antennae and palpi dark brown; dorsum of thorax velvety black with the anterior and lateral margins

¹Bul. 10, n. s. 1898. p.63.

narrowly, and posterior margins in front of scutellum, widely silvery gray; also two narrow longitudinal gray stripes on dorsum. Or the dorsum might have been described as silvery gray with three very wide velvety black longitudinal stripes, abbreviated behind. Pleura black, bare; scutellum velvety black; metanotum silvery gray; abdomen velvet-black, the sides of first two or three segments of the ventral surface with a silvery reflection in some lights; legs black, the tips of the fore femora, the basal half of fore and hind tibiae (sometimes the middle one also) the basal two thirds of hind metatarsi, and the extreme base of the second hind tarsal joint, yellow. Fore tibiae with a single spur, middle and hind tibiae with each two; tarsal claws tridentate. Halteres bright orange-yellow. Wings hyaline, the vein yellow. Length, 3mm.

In an article by Lugger¹, it is stated that in *S. tribulatum* the male is much smaller than the female, having very large brilliant, red eyes that meet on top of the head; the body is velvety black with bright golden yellow and blue spots; the female is gray with black markings. This species is said to be most abundant in Minnesota, where it is called "the black fly." No further description is given; the figures of the male and female agree with the description of *S. vittatum*. Some specimens sent by Mr Washburn of the Minnesota Experiment Station, labeled *S. tribulatum* proved to be *S. vittatum*. I have specimens of larvae and pupae which belong to *S. vittatum*, which were sent to me by Professor Needham, he having obtained them from Mr J. C. Bradley of Philadelphia.

Larva (of *S. vittatum*). Somewhat mottled gray, the sides of each segment blackish. The larvae and pupae were collected by Mr J. C. Bradley, Philadelphia, 1901. The head is of the usual reddish brown color; the pale yellow antennae long and cylindric, the second joint about one third the length of the first, the third is a pointed process at the tip of the second. The fans have about 40 rays, the cilia being relatively minute. The mandibles are provided with three large apical teeth besides the row of secondary ones; the apical pair of bristles is present. The maxillary palpus has a few spines, and a tuft of a few spines on the basal joint. Hypopharynx and labrum apparently like those of other species. The labium has an elongate middle tooth, those at the end nearly as long, the

¹Minn. Agric. Exp. Sta. Bul. 48, p.207.

intermediate ones short [pl.35, fig.2], and there are six bristles in each of the two longitudinal rows on the ventral surface. The three blood gills at caudal end are unbranched.

Pupa. The thoracic respiratory filaments each consist of a single main trunk, from which arise eight branches, each of which divides into two, thus making 16 twigs in all [pl.35, fig.1]. Near the basal margin of the last few abdominal segments, are a few caudad projecting dorsal hooks, and on the tip of the last segment is a pair of blunt spines. The pupal case is of the wall pocket type, from which the respiratory filaments of the pupa project. Judging from the number of respiratory filaments of the pupa, the species described by Osten Sacken in *American Entomologist*, volume 2, seems to belong here.

Simulium sp. C. H. Townsend

Am. Ent. Soc. Trans. April 1893. 15:45

The larva and pupa of a species which appears to differ from *S. var. piscicidium*, are described by Townsend [*loc. cit.*], the only species with which it might be confused. Specific characteristics are as follows:

On the dorsal surface of the head are several rows and groups of nearly concolorous markings . . . Antennae pale, nearly as long as one half anterior width of head, three jointed, first joint very elongate, and narrow, not swollen, slightly curved, with a somewhat faint transverse suture on basal two fifths, cylindric below suture, beyond the suture very slightly and somewhat irregularly narrowing to tip; second joint narrower than tip of the first, straight and of equal width except slightly widened at base, a little more than one third as long as first joint, and with two small, triangular budlike processes, one on each side at the base, springing from the junction of the two joints and approximated to the second joint; third joint extremely small, short, minute, triangular, but little longer than wide, about the same shape as the minute processes at base of second joint. Fans consisting of about 60 scythe-shaped rays each, microscopically thinly hairy . . . Mandibles furnished with teeth on inner side at apex; four large teeth on apex, nine or 10 teeth behind these, gradually decreasing in size, except that the second of these is larger than the first, a large tooth still behind these; with a small one directly beside it . . . Thoracic proleg with at least 30 obliquely longitudinal rows of hooks, and probably more; at base of these there is a marginal transverse row of bristles on side toward body (the leg being flexed forward) extending around laterally, but wanting on outer surface . . . Blood gills a soft, retractile, primarily three branched organ just anterior

to these on dorsum, each branch being subdivided into five smaller branches or papillae. Length 11–13mm. Width of head about 1mm. Of anal portion $1\frac{3}{5}$ mm. [The figure given by Townsend shows the mandible with the apical bristles.]

Pupa. General color pale brownish yellow on the thoracic portion, abdomen darker; head, wing and leg cases, and filaments pale yellowish, the head sometimes brownish; prothoracic filaments arising from a single stalk on each side, which branches at base into usually eight filaments; these do not subdivide. Third and fourth abdominal segments with five or six brown hooks or spines on posterior margin of dorsum. Length excluding filament, 4.5mm.

Cocoon or case. Massed in coral-like aggregation. Open at top but enveloping all of the pupa, except the filaments or the extreme anterior portion of the hunchbacked thorax. Length 4mm. Abundant in a small stream in one of the branches of Grand cañon. July 8–11, 1893. This branch or side cañon, is one down which the Hance trail leads, being situated about 55 miles in a straight line n. n. w. of Flagstaff Ariz.

Some larvae which I received from Professor Needham, to whom they were sent by Professor Cockerell from Las Vegas N. M., may belong here. The general color however is reddish and it is only about 7 or 8mm in length. The labium has a more irregular outline than most of the other species [pl.35, fig.10]. The mandibles have a pair of apical bristles; labrum, hypopharynx, and mandibles resemble those of other species; on the head are six blotches arranged symmetrically about a median axis; each blotch consisting of two or three confluent black spots.

Simulium, species

Plate 35, fig.4-7

Some specimens of larvae and pupae sent me by Professor V. L. Kellogg, of Stanford University, collected in Santa Cruz mountains, differ from all larvae and pupae so far described.

Larvae. Length 6 to 7mm. Pale brownish gray above, with whitish venter and suture. Head whitish above, the margins brown. The fans with about 30 rays, its longer cilia conspicuous. The secondary fan at the base of the peduncle of the larger fan and usually composed of curved hairs, consists here of coarse, straight hairs. The mandible with apical pair of bristles [fig.6], maxillary palpus with some stout setae, labrum.

and hypopharynx as with other species. Labium with its teeth nearly of uniform size. Five or six setae in each of the two ventral rows [fig.7]. Anal papillae were retracted in all the specimens examined; hence I could not determine the number. The pupa has 12 respiratory filaments in each tuft [fig.4]. The abdominal hooks, curved cephalad, are as follows: three or four on ventral surface of each of segments 5, 6 and 7; eight on the dorsal surface of 3, 4 and 5; and a pair of very short, blunt tubercles on the anal segment. The pupal case is shaped as shown on plate 35, figure 5.

Family CULICIDAE

Mosquitos

The Culicidae, or mosquitos, have been studied and described by Dr Howard, Mr Coquillett and others in this country, and by Theobald, Ficalbi, Ross, Nuttall, Shipley, Grassi, and others in Europe in such detail that it is unnecessary to repeat here that which has already been done. I shall therefore content myself with merely giving a synopsis of the generic characters of the larvae, pupae and adults, and describing a few forms such as have come under my notice, together with figures illustrating details of structure. An extensive bibliography is given by Ficalbi in *Bullet. d. Soc. Ent. Italiana*, 1896, to which the reader is referred. Nuttall and Shipley, in the *Journal of Hygiene*, 1:75, give a bibliography of the more recent work. I shall therefore give only a few references to articles which occur in American literature and a few of the more important of the works of Europeans.

Brief bibliography of the biology of the Culicidae

- Coquillett, D. W. (1900) Table to the genera and species in U. S. Dep't Agric. Cir. 40, ser. 2, bul. 25, n. s., and table in Howard's book, Mosquitos (1901).
- Dyar, H. (1901) Life History of *Uranotaenia*, and Descriptions of the Larvae of Two Species of *Culex* and One of *Aedes*. N. Y. Ent. Soc. Jour. Dec. 1901.
- (1902) Illustrations of the Larvae of North American Culicidae. 2, 10:194 and 3, 11:23. N. Y. Ent. Soc. Jour.
- (1902) Notes on Mosquitoes on Long Island N. Y. Ent. Soc. Wash. Proc. 5:45.
- (1903) Notes on Mosquitoes in New Hampshire. Ent. Soc. Wash. Proc. 5:140.

- Ficalbi, E.** (1899) Venti specie di Zanzare. Soc. Ent. Italiana Bul.
 — (1896) Rev. sistematica d. fam. delle Culicidae Europee. Soc. Ent. Ital. Bul.

This contains an extensive bibliography.

- Giles, G. M.** (1900) Gnats or Mosquitoes; a compilation of the descriptions of the mosquitoes of the world.
Howard, L. O. (1900) U. S. Dep't Agric. Cir. 40, ser.2
 — (1900) U. S. Dep't Agric. Div. Ent. Bul. 25, n. s.
 — (1901) Mosquitoes. McClure, Phillips & Co.

This gives the most complete account we have of the biology of mosquitos.

- Meinert, F.** (1886) De eucephale Myggelarver, in Vidensk. Selsk. Skr., 6. Raekke, naturvidensk. og math. Afd. 3.4.

Contains about 60 quarto pages and two plates on the biology and structure of the Culicidae.

- Nuttall & Shipley** (1901) Structure and Biology of Anopheles. Jour. of Hygiene, 1:75.
Osten Sacken, C. R. (1868) Am. Ent. Soc. Trans. 2:47, and Western Diptera, p.191 (1877)

- Smith, J. B.** (1902) Ent. News. 13:268 and 299.
 — (1902) N. Y. Ent. Soc. Jour. 10:10.

- Theobald, F. V.** (1901) Monograph of the Culicidae. 2v.

With atlas of 37 colored and 5 photographic plates.

- Weissmann, A.** (1866) Die Metamorphose der *Corethra plumicornis*.

Also papers in the reports of the various state experiment stations, by Lugger, Osborn, Herrick, and others.

The mosquitos are small to medium sized flies, characterized by the projecting proboscis (sometimes lobed) and by the plumose antennae of the male. The head is small, round; eyes reniform, and ocelli are wanting. The antennae are threadlike, composed of 15 joints, counting the disklike base; the first joint is thick, the following joints small, round and beset with whorls of hairs, forming in the male a long, dense plumosity; the last two joints in the male are slender and bare, or nearly so. The thorax is ovate, arched, but not projecting over the head, without transverse suture, scutellum narrow; metanotum arched. Abdomen long and narrow, somewhat flattened, composed of eight segments; male genitalia prominent, ovipositor short, legs long and slender, the coxae not elongated; the tarsi long. Wings long and narrow, with numerous veins; the hind margin fringed, the costal vein extending all around the wing, and in all known American forms the veins are covered with scales. Venation as in the figures.

The larvae are known as "wrigglers." The head is fully differentiated and usually has eyes; the mouth is usually thickly

ciliated with hairs, by means of which a current of water is produced that brings little particles of food within reach. At the posterior end of the body is usually a single breathing tube, or there are two tubes opening to the exterior on the dorsal surface of the last segment. The segment behind the head is without prolegs.

The pupae are free swimming, and very active. The breathing tubes are situated at the sides of the thoracic segments. The abdomen terminates in two leaflike appendages, that act as propellers; but in general the pupae remain near the surface, except when disturbed.

KEY TO GENERA OF CULICIDAE OF THE NORTHERN STATES

Larvae

- 1 The last abdominal segment with a single dorsal breathing tube, through which may be seen a pair of large tracheae.....(4)
Last segment without long breathing tube.....(2)
- 2 Last segment dorsally with a flat area in which may be seen two spiracles(3)
Last segment usually with hooks, no spiracles apparent.
Larva transparent, glasslike.....*Corethra*
- 3 Large species with the anal segment bladderlike. Mandibles strongly developed [pl.41, fig.1].....*Pelorempis*, gen. nov.
Species of medium size with anal segment cylindrical...*Anopheles*
- 4 Antennae pendant and ending with four large curved spines.
Mochlonyx (Europe)
Antennae not pendant.....(5)
- 5 Antennae fold back against head and terminate in 2 or 3 claws [pl.40]*Corethrella*
Antennae usually only with a few small erect bristles and one or two pointed processes.....(6)
- 6 With brush of hairs projecting forward from the mouth.....(7)
Brush projects laterad from the mouth. Mandibles long and sharply toothed; large species about 10mm long.....
Psorophora (ciliata)
- 7 No ventral brush on last abdominal segment.....(10)
Last segment with ventral brush.....(8)
- 8 Anal blood gills dilated; lateral comb of eighth segment a single transverse row of spines with elongated bases; anal segment without hair tufts before barred area.....
Stegomyia (fasciata)
Anal blood gills slender.....(9)
- 9 Anal blood gills sharply pointed, air tube spines with one tooth; lateral comb of eighth segment a few large spines in a single or partly double row.....*Aedes* (fuscus)
Not as above in all respects.....*Culex*

- 10 With two anal blood gills; the two lateral combs of the air tube wanting. Small species; found in water in the pitcher plant *Aedes (smithii)*
 With four blood gills; with stellate hairs on the abdomen. Small species *Uranotaenia (sapphirina)*

The southern genera *Toxorhynchites*, *Megarrhinus* and *Conchyliastes* are not included in the above table; their larvae have never been described as far as I am aware.

Pupae

- 1 Swimming paddles, two pointed lobes [pl.40].....*Corethrella*
Swimming paddles rounded.....(1a)
1a The respiratory tube of the thorax spindle-shape, pointed at
the apex(2)
Tube cylindric or trumpet-shape.....(3)
2 Both inner and outer margins of the swimming paddles with
reinforcing ribs, but without spine at the apex.....*Corethrella*
Only the middle rib present; last segment short, seventh
segment considerably longer than either the sixth or
eighth*Moehlonyx* (Europe)
3 Apex of swimming paddle ending in a small spine.....(5)
Apex with a few cilia or short hairs.....(4)
4 Small species 2 or 3 mm in length; last two segments with
a thick brush of hairs on each side... ..*Aedes* (*smithii*)
Large species, 7 or 8 mm in length.....*Psorophora*
5 Large species at least 8 mm in length.....(6)
Moderate or small sized species.....(7)
6 Apex of swimming paddle ending in a short, sharp spine...
Pelorempis gen. nov.
Apparently without a spine (?), with a pair of stellate hairs
on the first abdominal segment.....*Psorophora*
7 Thoracic breathing tubes much elongated, about 12 times as
long as wide. Abdomen with a number of stellate hairs..
Uranoaenia (*sapphirina*)
Tubes not elongate.....(8)
8 Tube about as wide as long.....*Anopheles*
Tube longer than wide.....*Culex*

Imagos

- 1** Proboscis short, not much longer than the head.....(2)
Proboscis elongate, longer than the head and thorax taken
together(4a)
- 2** Metatarsus longer than the following joint.....(3)
Metatarsus shorter than the following joint..M o e h l o n y x (Europe)
- 3** Species less than 4 mm in length; tarsal claws simple.....(4)
Large species, 10 or more in length; tarsal claws bifid.....
Pelorempis gen. nov.
- 4** Antennae verticillate with hairs (i. e. in whorls).....C o r e t h r a
Antennae wholly covered with hairs, legs densely hairy....

Corethrella

- 4a Legs bearing many erect scales. Large species.....*Psorophora*
 Legs without these scales.....(5)
- 5 Thorax with metallic blue scales; small species; male with
 but a single curved claw on the middle leg; palpi of both
 sexes two jointed and short.....*Uranotaenia* (*sapphirina*)
 Thorax not so marked.....(6)
- 6 "Hind feet black, their apexes snow white." Male palpi
 long, in the female short.....*Conchyliaestes*
 Not as above.....(7)
- 7 Palpi elongate.....(8)
 Palpi short.....(9)
- 8 The fourth fore tarsal joint shorter than the fifth, about as
 long as wide. Palpi elongate and pointed.....*Culex* (males)
 Fourth fore tarsal joint longer than wide. Male palpi
 with enlarged apical joints.....*Anopheles*
- 9 Small species with two jointed palpi; the second joint conical..*Aedes*
 Medium sized species, with four jointed palpi, its apical joint
 cylindrical*Culex* (females)

Of the southern genera, *Megarhinus* and *Toxorhynchites* may be known by their strongly curved proboscis and green and bluish colors. *Stegomyia* resembles *Culex*, but has the thorax marked with lines of silvery scales.

Subfamily CORETHRINAE

Genus CORETHRA Meigen

This genus together with *Corethrella*, *Mochlonyx* and *Pelorempis*, nov. gen. forms the subfamily Corethrinae, which is distinguished from the remainder of the family by the comparative shortness of the proboscis. There are but 15 or 16 species in the genus, four or five of which occur in North America. The life history of some of the species has long been known. Some of the works on the biology of *Corethra* are:

- 1844 **Staeger**. *Naturhist. Tidsskr.* I. R. 2. B. 549, 600. *Corethra fusca*.
 1866 **Weissmann, Dr A.** Die Metamorphose der *C. plumicornis*.
 1884 **Herrick, A.** *Minn. Geol. Nat. Hist. Sur.* p.10. *C. appendiculata*.
 1886 **Meinert, F.** *De Eucephale Myggelarver*, p.30 to 53. With bibliography.

Generic characters

Usually delicate, moderate sized species of the appearance of a Chironomid, but distinguished by its many veined wing. Head transversely oval, epistome somewhat projecting; pro-

boscis with round labellae, and only one half as long as the incurved, four jointed palpi; antennae 15 jointed, the basal joint disklike, the following joints each thickened at the base, in the male plumose, the last two joints elongated and slender; the eyes crescent-shaped. Thorax highly arched, without suture; scutellum rather small; metathorax prominent. Abdomen long and slender, somewhat flattened, from the base to the middle gradually widening, and again becoming narrower toward the end; hypopygium prominent, the ovipositor projecting. Legs long and slender, the metatarsus longer than the following tarsal joint; claws small and simple. The wing veins and the posterior margin thickly haired; venation as in the figures.

List of the North American species

albipes n. sp. See p. 398. Ithaca N. Y.

appendiculata Herrick, Minn. Geol. Nat. Hist. Sur. 1884. p.10.

Known only in the larval and pupal stage and may belong to some other genus.

plumicornis Fabricius var. *americana*. (See subsequent pages for synonymy)

Saranac Inn N. Y., Lake Forest Ill., White mountains, N. H. (Slosson), Minnesota (Herrick)

punctipennis Say, Acad. Nat. Sci. Phila. Jour. 1823. 3:16, and Compl. Wr. 2:43. Wiedemann, 1:14. Pennsylvania and New Jersey.

trivittata Loew, Berl. Ent. Zeit. 1862. p.186. (Centur. 2. 1). Maine, California, Alaska.

This is a synonym of *punctipennis* according to Giles in his work *Gnats or Mosquitoes*.

The larvae of but three North American species are known. To assist in separating the species which may be found later, I have given in the table the characters of some of the European species also.

- 1 Antennae shortish and with a spine outwardly; anterior part of the head is spiny; club-shaped bodies at the caudal end instead of claws.....*appendiculata* Herrick
Antennae with four spines.....(2)
- 2 Ventral comb of the last abdominal segment with a row of brushlike hairs; each consisting of five to seven bristles (European species).....*fusca* Staeger
Ventral comb consisting of a number of separate feathered hairs [pl.39, fig.6].....(3)
- 3 The pair of leaflike appendages [pl.39, c. fig.4] lying cephalad of the labrum (*l*), at least one half as wide as long; ventral comb of the last abdominal segment with 25 hairs.....(4)

- Appendages over the labrum lanceolate and four or five times as long as wide, ventral comb of last segment with 21 hairs (European) *pallida*
- 4 "One of the four antennal bristles markedly shorter than the rest" *plumicornis* (Europe)
- The four antennal bristles of equal length; anal segment with four dorsal hairs..... *plumicornis*, var. *americana*
- The larva of *C. trivittata* described by Dyar in N. Y. Ent. Soc. Jour. 10:201 is said to have but 2 dorsal hairs on anal segment.

Pupae

- "Extraordinarily elongate abdomen which terminates in two paddlelike appendages, loosely ciliate outwardly"..... *appendiculata*
- Abdomen of moderate length, see figure; paddles with short cilia on the inner margin..... *plumicornis*

Imagos

- 1 Wings with dark markings.....(2)
- Wings unmarked(4)
- 2 Wings with several cross bands. Length of insect 1.5mm....
- Corethrella brakeleyi*
- Wings with numerous dark spots.....(3)
- 3 The apex of both femora and the tibiae, and the base also of the tibiae, black, antennae with subfuscous hairs. Length 4.5mm *trivittata*
- Legs punctate with numerous small brown spots. Antennae with yellowish hairs..... *punctipennis*
- 4 Yellowish white species; legs white and spotless..... *albipes* n. sp.
- Pale brown or reddish yellow species..... *plumicornis*

Judging from the description, the larva of *appendiculata* differs greatly from all the known *Corethra* larvae, and F. Meinert in *De eucephale Mygglarver* says in regard to its pupa that the figure given by Herriek resembles that of a Chironomid rather than a *Corethra*. In the same paper Meinert expresses the opinion that *fusca* is but a darker variety of *plumicornis*; and attributes the differences in the larva to an error of Staeger, assuming that the latter described some other species.

Corethra appendiculata Herriek

Minn. Geol. Nat. Hist. Sur. 1884. p.19, pl.5.

The adult not bred. Larva as follows:

Form is more slender than *plumicornis*. The tracheal vessels are of a different form and color, and viscera have obvious differences. . . Shape of the head is slender and attenuated toward insertion of the antennae. Antennae are shortish

and have a spine outwardly. The cuticular appendages have an unusual form, as has the labrum. The anterior part of the head is spiny. The armature of the end of the abdomen is peculiar. The posterior rudimentary appendages are of a different form, and the claws are replaced by club-shaped bodies. A curious appendage below is indicated in the name. The pupa has an extraordinarily elongate abdomen which terminates in two paddle-shaped appendages, loosely ciliate outwardly. From Lake of the Isles near Minneapolis Minn. *Herrick* [*loc. cit.*]

Corethra plumicornis Fabricius

Plate 39

Ent. Syst. 1794. 4:246-58

The following synonymy is according to Schiner, *Fauna Austriaca*, 1864. 2:624.

1776 *cristallina* Degeer (Tipula), Ins. 6:149, 20

1787 *pilicornis* Fabricius (Tipula), Mantissa Ins. 2:325-49

1788-93 *hafniensis* Gmelin (Tipula), Syst. Natur. 2826, 108

1794 *plumicornis* Fabricius, Ent. Syst. 4:246-58

1800 (?) *lateralis* Panzer, Fauna Ger. 109:16

1818 *plumicornis* Fabricius, Meigen, Syst. Besch. 1:15. 1

1864 *plumicornis* Fabricius, Schiner, Fauna Austriaca. 2:624

C. plumicornis, var. *americana*

Male. Reddish brown; abdomen yellowish; the antennal joints yellow with brown tips, basal joint brown; the hairs pale brown; the front, the upper surface of the proboscis, and the palpal joints brown; the incisures of the latter yellow, the vertex, the cheeks and the underside of the proboscis and neck pale yellow; thorax pale brown above with three dark reddish brown stripes, the middle one divided by a fine, pale brown line; the lateral stripes abbreviated anteriorly, the median one posteriorly; the pectus and the margins of the pleural and jugular sclerites reddish brown; scutellum pale brown, metathorax dark brown; abdominal segments subequal in length except the first and last, which are less than one half of the others. The dorsal surface is brown with pale yellow incisures. The brown coloring is darkest anteriorly, gradually becoming paler caudad, so that the posterior margin of the segment is almost as light in color as the incisure. This is particularly true with segments 3, 4 and 5. On segment 6, 7 and 8 the brown color is almost wanting excepting a triangular lateral spot which is prolonged caudad in a fine line. The outline of this spot, however, is not distinct, but is blended in with the color of the dorsum. A pair of very small pale yellow spots with a narrow brown border are more

or less distinctly visible on each segment. The hypopygium consists of two jointed hooks, is pale brown in color, nearly as long as an abdominal segment [fig.8]. Venter and the legs are pale yellow, the last two or three tarsal joints slightly infuscated. Legs and abdomen densely but delicately haired; wings yellowish, the veins scarcely dark; venation as in figure 10; halteres pure white. Length $5\frac{1}{2}$ mm.

Female. Differs from the male in the following particulars. Antennae entirely yellow, basal joint, palpi and upper surface of proboscis with a tinge of brown; frontal spot brown; scutellum with a fine median line and its posterior margin pale yellow; abdomen yellow, dorsal surface with a tinge of brown, specially on the posterior margin. The two little white spots with pale brown margins also present on each segment. Anal segment brown, genitalia yellow, venter, legs, halteres etc. as with the male. Wings as in figure 9. Length 5mm. Described from alcoholic specimens. New Jersey, Illinois, New York, Minnesota.

Larva differs from Meinerts description [*loc. cit.*] of the European *plumicornis* in the following particulars. The four long bristles of the antennae are of equal length, while in the European form one is distinctly shorter than the rest; the head in all alcoholic specimens is more sharply constricted from the thorax. In Weissmann's figure the spines of the antennae are shown of equal length.

The larva is colorless, in alcoholic specimens pure white; the large eyes, the pair of air sacs in the thorax and in the seventh abdominal segment are black and the tips of the mandibles brown. The head is somewhat elongate, subconical, the antennae pendant [fig.4a], each with four long bristles of equal length. Caudad of these are 10 filaments, five on each side of the median line [fig.4b]; these are the filaments of the third metamere of Meinert. Then comes the pair of leaflike appendages, appendages of the third metamere of Meinert, [fig.4c]; following which is the labrum.

The labrum [fig.4l] is an elongate fleshy, fingerlike process, terminating in several tufts of hair. The two ventral tufts each with from 20 to 25 coarse hairs. At the base and somewhat cephalad of the mandibles [fig.4m] are the fans [*f*] each consisting of from 18 to 22 long, coarse hairs. The mandibles [*m*] have four or five teeth, two stout spines anteriorly, and a serrate posterior margin. Closing in the lateral posterior margin of the mouth are the maxillae [fig.4x]; fleshy lobes, each with a long, jointed appendage anteriorly and two short stout spines. At the posterior border of the mouth is the labium [*l*] with

two short spines. The thorax is cylindrical, of greater diameter than the abdomen; the two black air sacs distinctly visible. The abdomen is of circular cross section, tapering gradually toward the caudal end. Segments are subequal in length except the first, which is somewhat shorter; each provided with a few short hair tufts. The black air sacs of the seventh segment are large and distinct. On the ventral surface of the anal segment [fig.6] is a fan of 25 long, feathered hairs, arranged on a keel or ridge. At the apex of this segment are four elongate blood gills and four long, feathered hairs, and near the apex, arranged in a transverse row on each side, is a comb of about 15 small, short hooks, curved cephalad; attached to the base of each hook is a delicate transparent, sickle-shaped blade, with a serrate inner margin; the surface of the blade is covered with transverse ridges, which give it the appearance of a curved pectinate hair, owing to its transparency. The combs are difficult to see. Ventrad of the combs is a pair of large blunt hooks curved cephalad.

The pupa [fig.2] resembles that of *Culex*, pale yellow in color, the thorax with three brown longitudinal stripes, the middle one divided by a yellow line. Eight abdominal segments are present, the first and eighth shorter than the others, and on each are found a few scattered hairs. Attached to the eighth segment are the swimming paddles [fig.5]; these differ from those of *Culex* in having, besides the median rib, each margin also supported by a rib. On the inner rib is a row of cilia. The breathing trumpet [fig.20] is spindle-shaped, covered with a close network of pentagonal and hexagonal figures. The small aperture is at the apex. Fig. 2

Corethra punctipennis Say

Acad. Nat. Sci. Phila. Jour. 1823. 3:16. and Compl. Wr. 2:43. Wiedemann. 1828. 1:14

Whitish; wings and feet punctured with fuscous. Inhabits Pennsylvania.

Hair of the antennae yellowish white, the centers of the whorls being fuscous; the shaft of the antennae has a decidedly annulated appearance; eyes black; thorax with three pale yellowish brown abbreviated, broad lines, the middle one originating before and terminating at the center of the disk, the lateral ones originating rather before the middle; feet with numerous small brown punctures; wings with many very obvious brown spots.

Size of *C. culiciformis* Degeer (i. e. 6mm)

Corethra trivittata Loew

Berl. Ent. Zeit. 1862. Centur. 2, p. 186

Male. Pale yellowish, with three thoracic stripes, the metanotum, fasciae of the abdomen, with apical rings of the femora, and basal and apical rings of the tibiae, fuscous black; the wings with cinereous spots. Length 4.3mm. Wing 5mm.

Pale yellowish, with long, mostly subfuscous pile. Antennae black, annulated, densely verticillate with subfuscous hairs. Dorsum of thorax with three black stripes, the double median one posteriorly, the lateral stripes anteriorly, much shortened. The sides of the scutellum fuscous; metanotum fuscous black; the abdomen fasciate with fuscous. Legs pale yellow; the tarsi from the tip of the first joint pale fuscous; an apical ring on each of the femora and an apical and a basal ring on each tibia is blackish. The wing variegated with some small cinerous black spots. Maine, California, Alaska. (*Osten Sacken*)

This is a synonym of *C. punctipennis* according to Giles in *Gnats or Mosquitos*.

The larva and pupa of this species are described by Dr Dyar.¹

The only apparent difference between this and the larva of *plumicornis* seems to be that in the former species there are but two hairs on dorsal surface of anal segment while there are four in *plumicornis*.

Corethra albipes nov. sp.

Female. Entire insect pale yellow in ground color; head and antennae wholly pale yellow; dorsum of thorax with three longitudinal stripes pale buff in color, the lateral ones abbreviated anteriorly, the median one posteriorly, the latter divided longitudinally by a pale yellow line. These stripes all narrowly margined with brown, and on the anterior and outer margins of the lateral stripe are a few tiny black specks. Scutellum with a pale buff posterior margin; pleurae yellow, sparsely sprinkled with small, irregular black specks; abdomen yellowish white beneath, pale buff colored above, lateral margin sparsely sprinkled with small irregular black specks; legs pale yellowish, unspotted, fourth and fifth tarsal joints slightly darkened; claws simple; legs and abdomen covered with long, loose yellow hair; wings uniformly pale yellowish, the veins, the hair on them, and the halteres same color. Venation as in plate 39, figure 11. Length 5½mm. Ithaca N. Y. August 1901.

¹ N. Y. Ent. Soc. Jour. 10:201.

CORETHRELLA Coquillett

N. Y. Ent. Soc. Jour. 10:191

Plate 40

Through the kindness of Prof. John B. Smith of New Brunswick N. J. from whom I received specimens of larvae, pupae and adults, I have been enabled to make a study of this interesting species, which in the adult stage has already been described under the name of *Corethra brakeleyi* by Mr D. W. Coquillett.

From *Corethra* it differs in the following particulars:

In both the male and female the thorax, scutellum, abdomen and legs are sparsely covered with long coarse hairs, many of these being as long as the fore metatarsus. The antenna of the male is thickly covered with long hairs arranged all along the shaft excepting on the apical half of the 13th, and all of the 14th and 15th, which have only short hairs. The 15th or apical joint is slightly enlarged and conical [fig.8]. The antenna of the female has a circlet of a few long hairs at the base of each joint and another irregular circlet of somewhat shorter hairs on the middle of it.

In *Corethra*, at least in those species with which I am familiar, the male has one circlet of many long hairs at the base of each joint, standing nearly at right angles with the shaft. In the female these hairs are fewer and shorter; the second circlet of hairs wanting. In a balsam mount of *Corethrella* the 15 antennal joints can easily be counted. The eyes are reniform; the palpi and proboscis are short, the former about twice as long as the latter; the metatarsus is longer than the following joint and the tarsal claws [fig.7] are simple and much curved.

***Corethrella brakeleyi* Coquillett**

Larva. The larva resembles that of *Mochlonyx* much more closely than that of *Corethra*; it differs from the former in having the antennae attached near the middle line of the head at the extreme cephalic end, hinged so that they move in a horizontal plane, and normally lie folded back against the side of the head, as shown in figure 1 and 2. The head is transversely oval. The antennae [fig.2] have three long curved spines and

one very short one at the base. Of the longer spines one is somewhat longer than the other two. The dorsal sclerite of the head [fig.1*d*] is somewhat quadrangular in shape, and is provided at its cephalic end with six setae, the median pair being quite small. The lateral sclerites [fig.1 and 2*b*] are nearly hemispherical, with a small black pigment spot on the dorsal surface near the anterior margin; just cephalad of this is a stout seta, laterad of it is a long slender one, and mesad of it a small irregular area of ommatidia. On the middle of each lateral sclerite, arranged in a single transverse row, are about 12 stout spines projecting cephalad, and immediately in front of this row are two or three long slender setae. At the base of each antenna on the frontal sclerite is another seta.

The labrum is a transversely oval piece [fig.4] which is attached at the cephalic margin of the head and hangs flaplike downward and backward over the mouth; its free end provided with two curved, pale yellow spines, between which are several rows of flattened, short, yellow, forked spines. At the base of the labrum are two pairs of rather long, curved setae, and on the center are two pairs of very short, delicate ones.

The mandibles [fig.2 *md*, 5 *md*, and 6] move in a horizontal plane and when folded down are visible only from the ventral aspect. On the inner (mesal) margin near the apical end is a row of seven stout black teeth; on the dorsoapical margin are two stout flattened spines, which, when the long axis of the mandible is parallel to the body, projects mesad nearly at right angles to the long axis of the body. Also on the dorsal surface, a little apicad of the middle are two unequal long and very stout setae; and proximad of these are seven long and one short lanceolate spine attached to a small crescent-shaped basal piece. When viewed from the ventral surface [fig.5] two slender setae may be observed near the lateral margin.

The maxillae [fig.5*mx*] are two lobed. One is of irregular shape, about as long as wide, articulated at its base, with a seta at the apex, and having a small palpus with three or four pointed processes a little laterad of this seta. On the mesal margin are a number of long stout, setae, and long slender hairs. The second lobe [*mx*, *i*], ventrad and mesad of the first, is elongate with a stout seta on the anterior mesal margin. No suture between it and the head sclerite is visible. It may in fact, be a cephalic prolongation of the lateral sclerite of the head. The labium [fig.5*l*] is immovably joined to the ventral sclerite of the head, no separating suture being visible. Its cephalic margin has about 16 stout black teeth, alternating long and short.

The hypopharynx (not shown in the figure), is tonguelike, and lies immediately dorsad of the labium on the floor of the mouth cavity. It is about as wide as the toothed portion of the labium, its anterior margin provided with a fringe of pale, short, fingerlike processes, which barely project beyond the edge of the labium when viewed from below, and is not visible without dissection.

The thorax [fig.1] is transversely oval, not as wide as the head, with the three segments quite distinct. On the lateral margins of each segment are a few tufts of long laterad projecting setae, those on the second and third segments being longer and more numerous than those of the first, and inserted at the tips of fingerlike processes.

The abdomen [fig.1] is nine segmented with long setae on the margins; the setae of the anterior segments being longer than the posterior ones. The tufts of setae of the first and second abdominal segments are inserted on lobular processes like those of the thorax. The eighth segment is shorter than those preceding it; the ninth is slender and cylindric, and makes an angle with the long axis of the body. At its apex are four small blood or tracheal gills, dorsad of which are a pair of long setae, and ventrad, a tuft of them.

Projecting from the caudal margin of the dorsal surface of the eighth segment is the breathing tube, a cylindric tube, as long as, or longer than any abdominal segment, its diameter being less than half its length. At the apex of the tube are several setae, and triangular flaps to cover the aperture.

The color of the head is brown, that of the thorax and abdomen grayish with white incisures. On the dorsal surface of each abdominal segment, surrounded by the whitish field and caudad of the incisure, is an oval, brownish spot. [See fig.1]

Pupa. The pupa [fig.10] resembles that of *Culex*, but differs from it and from other Culicidae known to me, in lacking the broad swimming paddles. In place of them, there are two pointed processes, each with three spines at the apex and a single one laterally near the middle. The breathing trumpet as in *Culex*, the plane of the margin being quite oblique, but on the rim of the inner side is a little rounded projection. Each abdominal segment has several pairs of setae, the median pair quite stout, the intermediate pair very short and slender and the one or two laterals long and very delicate. In addition to the laterals, there is a longitudinal lateral fringe of very delicate hairs, and the lateral margin is serrate.

Imago. This has already been well described by Mr D. W. Coquillett; and the description is reproduced below.

In addition to the generic characters which have been pointed out, I may say that the wing is heavily fringed with long hairs, and the veins are covered with scales. The venation is shown in fig.9.

Of the life history Professor Smith has given an account in the *Canadian Entomologist* for 1902.

***Corethrella brakeleyi* Coquillett**

Ent. News, March 1902. p.85

Male and female. Dark brown, the antennae, halteres, knees and tarsi yellow, plumosity of male antennae yellow, mesonotum opaque, gray pruinose except three narrow vittae and a few spots near the humeri, hairs of thorax brownish, those of the abdomen yellow, tibiae and tarsi bearing many long hairs; first joint of front tarsi slightly shorter than the tibia; wings whitish hyaline, marked with a brown cross band near one third and two thirds its length, the first one oblique, the second band produced triangularly near middle of its inner side, costal margin on each side of this band strongly tinged with golden yellow, fringe white, marked with a brown spot at posterior end of each cross band and on either side of the extreme wing tip. Length, 1.5 mm.

One male and three females, bred jointly, Aug. 12 to 14, by Mr J. T. Brakeley and Prof. J. P. Smith, Habitat-Lahaway N. J.

PELOREMPIS nov. gen.

Two peculiar larvae were found in a pail of cold spring water at Saranac Inn by Professor Needham, June 1900. One of them was kept till the fly emerged; the other till it had changed into a pupa. Both the larva and adult differ so much from all the species of the Culicidae that a new genus is necessary to contain it.

Female. Large species resembling *Psorophora* in general appearance. Head rounded; occiput strongly developed; proboscis a little longer than the height of the head with rounded labellae; palpi longer than the proboscis, four jointed (not counting the small basal joint [see fig. 10, 11]; the two end joints each longer than the preceding; antennae 15 jointed, the basal joint disklike, the second one short and thick, the rest, including the apical one, small, subequal in length, verticillate with a few hairs of moderate length; eyes kidney-shaped, much cut out around the base of antennae, separated from each other on top of head by only a narrow space; ocelli wanting; thorax

well arched, transverse suture wanting; scutellum narrow, metanotum well developed; abdomen long and narrow, eight segmented besides the anal segment; genitalia inconspicuous; legs long and slender, with fine short hairs, metatarsus nearly as long as the following four joints taken together; claws slender, each with a single tooth on the under side; wings long and slender, extending almost to the margin of the eighth abdominal segment; the margins, and veins except the true cross veins and the first anal, covered with flattened hairs. Venation as in the figure; anal angle obtuse, posterior lobe prominent and rounded. Halteres free.

Pelorempis americana nov. sp.

pl.41

Female. Antennae when flexed downward reaches just a trifle beyond the outstretched palpi. The upper surface of the epistome is brown, yellowish on the sides, the labrum pure white. The labium, which is somewhat prolonged beyond the labrum is brown beneath; this color extends to near the lobelike tip. The lobes are hemispherical and pale yellow, covered with blackish or dark brown bristles. Black hairs cover both the upper surface of epistome and the under surface of labium, and a few bristles on inner eye margin. The front is pale yellow on the lower part, and brown on the upper; the vertex is brown; back of head yellow; palpi brown, the articulations and all of the last two joints yellow, covered with black hairs; antennae reddish brown, the two basal joints and all of third joint except tip, and bases of all the others pale yellow, its hairs black. Thorax yellowish brown; the anterior margin of thorax, a spot on each side of it, four dorsal stripes, and a spot over the root of each wing reddish brown. The dorsal stripes are wide, the median pair only separated by a fine line much abbreviated posteriorly; the lateral stripes abbreviated anteriorly. Scutellum, pleura, and metanotum yellow, the latter with a triangular spot of brown anteriorly, which is prolonged backward into a fine median line; pectus reddish, or reddish brown; thorax and abdomen nearly bare; abdomen eight jointed plus anal segment, yellow, each segment with a reddish brown fascia which covers the posterior third of the segment, excepting its extreme edge. The anterior margin of each fascia produced forward at the middle and the sides till the brown color nearly reaches the anterior margin of the segment. The anal appendage consists of four rounded, inconspicuous pieces. The venter is paler than the yellow of the dorsum. Legs yellow, a few small spots on the coxae, the tip of all femora, base and tips of all tibiae and the tarsi except the

basal one half of the metatarsus are reddish brown. The brown of the tarsi seems to be due to the presence of the numerous brown hairs rather than to ground color. Tarsal claws reddish brown; all tibiae with a single delicate yellow spur; wings with brownish clouds, one on each of the three vein forks, a longer one covering the cross veins; an irregular one covers the bases of the veins and a cloud following the length of the cubitus. All veins with scales except the true cross veins and the first anal; venation as in figures. Halteres yellow with brown margins on knob. Length 10mm.

Larva. The empty larval skin from which the figures on plate 41 were made is in a very good state of preservation excepting for a longitudinal break on the dorsal surface of the head and thorax, and the distorted condition of the skin of the thorax and abdomen. In figure 1 [pl.41] the thorax and abdomen are somewhat diagrammatic and the proportions may not be exact owing to the above mentioned fact; the head and the anal appendages however are drawn to scale. The larva resembles *Corethra* and *Mochlonyx* (a European genus) in the form of the antennae, which are elongate, and provided with stout spines, set at an angle with the long axis of the antennae [fig.1, 2]. The spines are three in number, wherein this genus differs from *Corethra* and *Mochlonyx* which have four. The mandibles are more highly developed than in the other genera of this family, and possess two stout curved teeth, besides several smaller teeth and spines (ventral view figure 3m; dorsal view figure 5). The fanlike brush of hairs so conspicuous in *Anopheles*, *Culex*, etc. and somewhat also in *Corethra* and *Mochlonyx* seems to be wanting entirely here. The labrum [fig.6] is trapezoidal in shape, its anterior margin being straight. On its upper surface it is provided with two stout bristles, besides 10 smaller ones arranged as shown in the figure. Two converging rows of scales are present, these reaching the extreme front margin. One of these scales is shown in figure 9. The anterior margin is somewhat ciliated; and on the under surface are two converging rows of transverse chitinous ridges, five or six ridges to each row. The maxillae [fig.3r] resembles those of *Corethra*, its anterior margin provided with numerous scales and hairs. The scales resemble those of the labrum [fig.9]. At the base near the articulation of the mandible is a wartlike prominence with four short spines; this may possibly be the maxillary palpus. Toward the inner margin is a single stout bristle. The epipharynx and hypopharynx are wanting in this specimen, probably torn away when the larval skin was shed. The labium [fig.3l] is somewhat triangular in shape, its lateral and

anterior margins serrate, six teeth being present in the lateral and 10 in the anterior row. The shape of the head resembles that of *Mochlonyx*, but with the mandibles more prominent; it is reddish brown in color and heavily chitinized. No eye spots are visible in the specimen.

The thorax is provided with about eight tufts of feathered hairs on each side, the abdomen with about seven pairs. It is possible that several of the more caudad of what is here termed thoracic tufts may belong to the first few abdominal segments. The anal segment and appendages resemble those of *Anopheles*. The dorsal breathing apparatus [fig.1, 4] shown somewhat flexed sidewise in figure 1, is star-shaped with four radiating pointed lobes, between the anterior pair of which open the two spiracles [fig.4s]. At the apex of each of the posterior pair is a single stout bristle. Between the spiracles is a pair of crescent-shaped chitinized brown patches, laterad of which is a pair of small bristles, and another pair is cephalad. The anal segment is ellipsoidal with a row of 31 tufts of hairs, each tuft composed of several hairs; at the caudal end are four (or six) very small blood gills, besides a single large tuft of hairs.

Pupa [fig.8]. This resembles that of *Culex* and *Anopheles*. The coloring is like that described for the adult. The breathing trumpets are somewhat less flaring at the top than *Anopheles*, but more so than is usual with *Culex*. On the posterior margin of the first segment of the abdomen are three feathered hairs on each side; 2, 3, 4, and 5 each have two feathered hairs on each side plus some scattered hairs; 6, 7 and 8 each have three or four simple hairs on each side. The swimming paddles [fig.7] have a single median rib ending in a short, stout spine.

The venation of the adult wing clearly locates this genus with the *Culicidae*; the form of the proboscis proves its relationship with *Corethra* and *Mochlonyx*, forming with these the subfamily *Corethrinae*.

Subfamily *CULICINAE*

This subfamily is characterized by the possession of the typical long proboscis, which is longer than the head and thorax taken together.

Genus *ANOPHELES* Meigen

Pl. 42, fig. 1-7, 9-11

Moderate sized species resembling the ordinary mosquito. Head rounded, occiput prominent; proboscis bristlelike and projecting forward, longer than the antennae; the palpi in both sexes as long as the proboscis, four jointed, the two end joints

taken together shorter than the one preceding, in the male long haired; antennae 15 jointed, the basal joint disklike, the following ones small, in the male long haired, in the female short and sparsely haired; eyes somewhat reniform, the ocelli wanting; the mesothorax rather long and somewhat pointed in front, and without transverse suture; scutellum narrow, the metathorax rather prominent; abdomen long and slender, eight jointed, the genitalia small and inconspicuous; legs long and slender, nearly bare; wings with the veins and the margin thickly haired, the venation as in the figure.

The females may be easily distinguished from *Culex* by the presence of palpi about as long as the proboscis; the male may be distinguished by the following characters. In *Anopheles* the last two palpal joints are much thicker than the first and second, and spatulate in form, while in *Culex* they are the same in diameter, the last one more or less pointed; further, in all the species which I have examined, a stump of a vein extends back into the basal cell from the base of the radial sector and another from base of R_4+5 ; this venation seems to be rare in *Culex*; in our species also the fourth tarsal joint of the fore leg in *Anopheles* is more than twice as long as wide, while in *Culex* it is no longer than wide.

Anopheles punctipennis Say

Aead. Nat. Sci. Phila. Jour. 1823. v.3 and Compl. Wr. 239.1

Male. Brown, covered with cinereous hair; head, antennae including the long hairs, palpi and proboscis uniform brown; thorax dark brown with three longitudinal cinereous stripes, the middle one divided by a fine brown line covered with sparse yellow hairs; pleura and scutellum, cinereous brown; metanotum and abdomen dark brown, the latter with the basal two thirds and the extreme posterior edge of each segment with a cinereous bloom, and covered with brown erect hairs; genitalia of moderate size, consisting of two, two jointed appendages, the joints of about equal length, the second one slender, curved and pointed. On the ventral aspect is a sharp caudad projecting spur [fig.10]. Legs uniformly brown except the knees and the extreme tips of the tibiae, which are yellow. The fore tarsal claws have each a long toothed claw and a very short simple one. The feet of the middle and hind legs each have two simple

claws. Wings with brown scales, a quadrangular patch of yellow scales just proximad of the fork of R_2 and R_3 covering a short section of both R_1 and the costal vein; an oblique patch at tip of R_1 , crossing the media, leaving the tips black of all excepting R_1 ; a few scattered pale yellow patches of scales elsewhere; and the posterior margin brown scaled, with patches of white ones at the tip of Cu_2 . Halteres pale yellow at base, the knob infuscated. Length $3\frac{1}{2}$ to 5 mm, exclusive of antennae and wings.

Female. Brown, as with the male; abdomen more uniformly brown, covered with nearly erect, fine, yellow hairs; scutellum and metathorax with a fine dark line; tarsal claws all simple; wings as with the male but wider in proportion to the length; venation as in figure 5; the basal section of R_{4+5} distad of the R-M cross vein, as the male. Everything else as in the male. Length 4 to 6 mm.

Larva. Three regions may be distinguished in the larva, viz the head, thorax and abdomen. The head is rounded, brown in color, and completely chitinized; the eyes are situated laterally and seem to be of two kinds; one is compact and more or less circular in outline, the other, visible only in older larvae, is a crescentlike body compounded of ommatidia-primordia of adult eyes. On a level with the eyes and cephalad of them are the antennae, and a trifle caudad of the base of these on the dorsal surface, arranged in a transverse row, are six feathered hairs. These are not placed on a band of pigment as is said to be the case with *maculipennis*. Between the base of the antennae and the base of the maxillary palpi, on a chitinized prominence, is a conspicuous branched hair. Near the tip on the dorsal surface of the labrum are two simple hairs projecting forward; these are more caudad than in *maculipennis*. Back of the transverse row of feathered hairs is another transverse row composed of four small feathered hairs; between the latter are usually nine more or less distinct pigment spots, the largest in the center, the others arranged around it. At the extreme cephalic end, at each side of the labrum, is a dense brush of brown hairs; another smaller brush is at the tip of the labrum and on the ventral surface of the labrum are several tiny tufts of hairs just in front of the mouth opening. The piece which carries the tufts on the sides of the labrum is called the scutum of the second metamere or clypeus. The antennae are two jointed, the first short and apparently immovable; the second elongate, free, bearing two rather long spines and two short ones, and a six branched hair, (Nuttall shows four in *maculipennis*). About one third of its length from the

base is a branched hair. The mandibles forming the sides of the mouth opening; each possess two stout, elongate, and four or five shorter black teeth at the apex, a little below which is a ridge with a serrated edge (not shown by Nuttall). Overhanging the teeth are three scythe-shaped rays, and between their bases and the base of the teeth are a number of brown hairs and one or more curved spines with a serrated inner edge. Projecting inward from about the middle of the mandible is a fan of hairs, and usually also several branched hairs are to be found on the outer margin.

The maxillae (first pair) each consist of a quadrangular piece with curved hairs on the cephalic, and straight ones on the inner margin. On the inner cephalic angle are several stout setae; the palpus is a conical process covered with short hairs, with three elongate spines at the tip connected by a web, and several shorter bristles. Laterally, near the tip, is a hair having four branches, each branch with several twigs. The maxillae together with the labium (underlip of Meinert) form the floor of the mouth cavity. The labium is a chitinized piece with seven to nine teeth on the cephalic margin, forming a continuation of the ventral wall of the head, to which it is articulated [pl.42, fig.3]. A small toothed piece, in outline resembling the labium but with fewer teeth, lying just inside of the latter, is what I take to be the hypopharynx (not shown in figure). Meinert in his work on *Myggelarver* [pl.41, fig.24], shows both of these, the one slightly displaced in dissection. The thorax is rounded, its segments obliterated. Twelve long feathered hairs stand on the dorsal surface besides some smaller ones and several simple hairs [pl.42, fig.2]. The nine segmented abdomen is provided with a number of feathered hairs besides many bristles. The first two segments each have two long feathered hairs on each side, the third has one (in all specimens examined); the fourth and fifth on each side, each with three or four simple hairs united at the base, the sixth, seventh and eighth, with but one or two, besides these there are two or three short feathered hairs, and several short, simple ones on each side of each segment. The only difference which I have observed in the hairy armature of the abdomen of this species and *maculipennis* [figured by Nuttall, *Journal of Hygiene*, v.1, pl.2, fig.4] is the presence of one or two more of the long, simple hairs on the sides of segments 4 and 5. The "palmate hairs" on the sides of 3 to 7 mentioned by Nuttall are also present in this species [pl.42, fig.4a]. On the posterior half of the dorsal surface of the eighth segment is the complex respiratory apparatus which surrounds the two stigmata [pl.42, fig.1]. In front of the two stigmata is a brown,

apparently chitinized plate, which may be folded over them, flaplike; on each side of them is a conical papilla with a few bristles at the apex. These are not figured by Nuttall though figured by Meirert for *C. maculipennis*. Prolonged backward are two lobes (somewhat pressed apart in the figure), and between these is an elongate, flattened, checkered plate forming the floor of the area. On the ventral surface of each posterior lobe are a branched hair and a few bristles. On either side of this structure is a comb, its teeth projecting caudad. Each comb has about seven long teeth, and between each of these are from one to four shorter ones. The cylindric ninth segment, when the animal lies horizontal, its dorsal surface uppermost, is suspended obliquely below the breathing apparatus, its dorsal surface covered with a chitinized plate or saddle. From its ventral surface, attached to a keellike process, is a fanlike arrangement consisting of two rows, each with nine branched hairs. On the dorsal surface are four hairs, the two anterior ones are feathered, the two posterior (and also a little more lateral) are branched. The anus is at the extremity of the segment, and surrounded by the four white papillae or blood gills.

Pupa. Resembles that of the other Culicidae. "When viewed sidewise, the pupa of *Anopheles* presents a comparatively smooth outline, but in *Culex* the edge where each tergum joins posteriorly the soft integument which unites it with the succeeding tergum stands out as a ridge, and the dorsal outline presents a series of salient angles" [Nuttall & Shipley]. "Respiratory trumpets are not so broad terminally in *Culex* as in *Anopheles*" [Howard]. [pl.42, fig.11]

Anopheles maculipennis Meigen

1818 *A. maculipennis* Meigen, Syst. Besch. 1:11 Compl. Wr. 1:241

1823 *A. quadrimaculatus* Say, Long's Exp. Apx. p.356.

1828 *A. quadrimaculatus* Say, Wiedemann, Aussereur. Zweiflüg. 1:13

Female. Brown. Wings with four fuscous spots. Head, antennae, proboscis and palpi pale brown. Thorax dull cinereous brown, covered with sparse yellow hairs; with two brown lines nearly contiguous posteriorly; pleura cinereous; scutellum and metanotum brown, the latter bare. Abdomen brown, rather thickly covered with suberect yellow hairs, ventral surface paler. Legs brown, the femora pale, knees and tips of tibiae pale yellow. Wings hyaline, the veins with pale brown scales, a spot of darker scales at the base of the radial sector, one at the fork of R_1 and R_2 , one at the fork of the media, and a

fourth at the cross veins. Venation as in figure 9. The basal section of R_{4+5} proximad of the R-M cross vein. Halteres pale, with a fuscous knob. Nuttall and Shipley state and also show in the figure which they give of the wing of *maculipennis* that the subcosta extends almost to the tip of the wing. In all specimens of females which I have examined this is not the case with the American form. Should this difference be found constant, Say's name of *quadrimaculatus* must be restored.

Larva. According to the description and figure given by Nuttall and Shipley [1901], it differs from that of *punctipennis* in the following particulars. The six feathered hairs arranged on the dorsal surface of the head are placed on a transverse band of pigment. On the dorsal surface of the labrum are two simple hairs projecting forward; these are more cephalad than in *punctipennis*. The pigment spots arranged symmetrically about the median line, so conspicuous in *punctipennis*, are wanting in this species. At the end of the second antennal joint is a four branched hair according to the figure given by Nuttall, whereas this hair has six branches in *punctipennis*. The mandibles show some differences. The only differences in the hairy armature of the abdomen which I have observed in *punctipennis*, in comparing with the description and figure of Nuttall of *maculipennis*, is the presence of one or two more of the long, simple hairs of segments 4 and 5 in the former species.

Pupa. Agrees in all particulars with the description given for *punctipennis*. A comparison of fresh specimens of both species will be necessary to reveal differences.

Genus *PSOROPHORA* Desvoidy

Large species which resemble *Culex* in having a straight proboscis; the male has palpi as long as the proboscis, those of the female being short. It differs from *Culex* in having many nearly erect scales on the legs.

Two species have been described from the United States. They may be distinguished by the characters given in the key below.

Length 6mm exclusive of the probocis; cell 2d R much longer than the cell M; body black, the humeri yellow, pleura and sides of the mesonotum bearing many appressed white scales, abdomen on the upper side covered with appressed violet purple scales, those on the first segment and a few at the hind angles of some of the other segments white. (Hartsville S. C.) Canadian Ent., 1901, p.258. *howardii* Coquillett

Length 9 or 10 mm; cell 2d R only a little longer than M [pl.42, fig.8]. Thorax striped; body brown; legs yellow, with dark brown or black erect scales. United States, widely distributed. Wiedemann, *Aussereur*. *Zweiflüg.* 1828. 1:13....

ciliata Fabricius

The life history of *P. ciliata* is given by Howard in the *Canadian Entomologist* for 1900 and also in his work on mosquitos. Of the larva he says, "from *Culex* it differs in having a longer breathing tube, longer and more pointed blood gills, and the hair fringe on the under side of the anal segment much longer and denser. The jaws are sharply toothed and very long." From the figure it appears also that the mouth brushes project laterally and not forward as in *Culex*. Figures are given in both of the papers of Howard, mentioned above.

Genus *CULEX* Linne

The species of this genus are the ordinary mosquitos. In most respects they are like the species of the genus *Anopheles*, but differ from them in that the male alone possesses the elongate palpi, in the female these are very short; the mesothorax is more arched and more nearly vertical in front; and the hypopygium of the male is quite conspicuous, whereas with *Anopheles* it is small and inconspicuous. In other respects, including the biting habits of the female, just like *Anopheles*.

It may be added, that in all species of *Culex* examined it was found that the fourth tarsal joint of the fore leg in the male is only about as long as it is broad; and that the last joint of the palpus is pointed. The wing venation also appears to present differences from *Anopheles*, in that the spur at the base of R_{4+5} is usually wanting in *Culex*.

Larva. The larvae are usually known as wrigglers, and characterized by their rapid wriggling movements, their wormlike bodies and disproportionately large heads with a pair of prominent eyes, an enlarged thorax, and their possessing on the dorsal surface of the eighth segment an elongate breathing tube. The eggs of some species are laid on the surface of the pond or pool in an oblong mass or boat, which in the warmer spring or summer weather hatches within a day or less. The small transparent larvae are extremely active from birth. They come to the surface to breathe, the elongate breathing tube of the last segment being in contact with the surface film, the cephalic end hanging obliquely downward. When disturbed the larva descends to the

bottom, jerking its body rapidly from one side to the other. It appears to be heavier than water, for sometimes it may be seen to descend quietly, apparently without motion; though, in order to rise, it "wiggles" to the surface. In the full grown larva the head, more or less rounded, is large, usually nearly as wide as the thorax from which it is separated by a narrow neck. The antenna, which arises from a slight prominence a little in front of the eye, consists of a single elongate shaft, with a short terminal joint (which appears to be annulated), several bristles and jointed hairs at the end of the first joint, and a tuft of hairs at about the middle of the shaft. Projecting from the middle of the anterior end of the head is a complex arrangement of hairs which spring from two folded ridges one on each side of the ventral surface of the labrum [pl.43, fig.5]. The length of the hairs varies with the species. Meinert [*De Eucephale Myggetarver*] speaks of this as a whorl, or rotatory organ, as he believes that it is by the vibrations of these bristles that the food is directed into the mouth. The greater part of the upper surface of the head is formed of a single plate which Meinert [*loc. cit.*] calls the dorsal surface of the third metamere. In front of this is a short, broad plate ("sentum of the second metamere," Meinert), called the clypeus by Giles [*Mosquitoes*]. [pl.44, fig.8c]

Attached to the anterior margin of the latter is the round prominence covered with hairs; this is the labium [pl.44, fig.8] or "sentum of the first metamere" [Meinert]. If the front part of the dorsal surface of the head be removed and turned ventral surface uppermost [pl.43, fig.5], the two fans or rotatory organs [fig.5f] may be seen, mesad and caudad of which are two tufts of hair projecting caudad. Between the latter is a rounded process on which are from two to four spines. This process together with the two tufts of hair, I believe to be the epipharynx[e].

The eyes are large and placed laterally, behind which and lying close to, may usually be seen a small ocellus. On each side of the mouth opening, ventrad of the fans, are the mandibles; stout, quadrangular pieces with a number of sharp teeth, at the cephalic end with two stout spines curved mesad, a row of hairs arranged on a ridge or keel overhanging the teeth and another row of long hairs arranged on the posterior margin [pl.45, fig.1, 2]. A fingerlike process with hair at its apex projects mesad from the mesocaudal margin [fig. 2a]. Ventrad of the mandibles are the maxillae [pl.43, fig.4x]. These are also indicated by dotted lines under the mandibles [*m*] on right hand side, the figure being a dorsal view of the lower half of the head,

the dorsal surface having been removed. The maxillae are fleshy ovoid processes with a longitudinal row or terminal tuft of hairs, besides the long, loose hairs on the mesal surface. Attached to the base and projecting laterad is the palpus with its four or five terminal spurs or papillae. Forming the floor of the mouth cavity, and attached to the anterior edge or coalescent with the sclerite which forms the lower surface of the head is the labium [pl.43, fig.4*l*]; a more or less triangular or semi-circular piece with a toothed margin. The ventral surface and margin is usually fringed with setae.

The hypopharynx is a toothed piece resembling the lower jawbone of a mammal, and lies tonguelike on the floor of the mouth cavity [pl. 43, fig.4*h* and pl.44, fig.6]. It is quite small and, being loosely attached, is easily torn away in dissection, hence somewhat difficult to find. Attached to the posterior edge of the hypopharynx [pl.44, fig.5], and lying obliquely, with reference to the frontal plane, but perpendicular to the sagittal plane, is an elliptic flat ring. This ring is compound, made up of four lamellae in close contact, so that it appears at first sight as a single ring; the surface of the lamellae is striated and fringed on the inner margin with long cilia. A portion of the front end of this ring is shown on plate 44, figure 5*s*. It appears to be the anterior margin of the gullet, and may perhaps act as a kind of sieve on which the food particles swept in by the rotatory fans, are caught. A second toothed piece [pl.44, fig.5*t*] lies dorsad of the anterior lobe of the hypopharynx, and is probably a part of it.

The thorax is circular in outline, and wider than the head. In the full grown larva the sutures separating the three thoracic segments can not be distinguished. On its surface are tufts of long bristles, longer usually than those on the rest of the body. These bristles are feathered, though not so much so as in *Anopheles*. The hairs appear to act as balancers. In addition to these hairs are a number of smaller, shorter tufts.

The abdomen is five or six times as long as the thorax, but of much smaller diameter; consisting of nine segments counting the anal segment. The segments are subequal in length excepting the first, eighth and ninth, which are frequently shorter. On the lateral margins are tufts of a few long hairs besides a few shorter ones, the arrangement of which may give specific characters, though, owing to the ease with which they fall off in alcoholic specimens, they must be used as distinctive characters with some caution. Projecting from the dorsal surface, near the posterior margin of the eighth segment, is a long, more or less cylindric tube, into which the two main respiratory

trunks can easily be followed, and are seen to open at its extremity. On each side of this tube is a single row of short spines, and at the base is a tuft of short hairs. On each side of the eighth segment is a comb composed of a variable number of short spines [pl.45, fig.6]; the tip of each spine is sometimes covered with short hairs.

The ninth abdominal segment, usually shorter than the others and of less diameter, contains the rectum and the anus, being almost at the extremity of the body. Around the opening are two pairs of delicate, elongate lobes. These are tracheal or blood gills. Immediately cephalad of these are dense tufts of long hairs, the position and arrangement of which are variable with the species. Usually also, dorsad of the blood gills are a variable number of long bristles.

Pupa. The pupa differs from those of the other genera of this family less than does the larva. It is characterized by its bulky, oval, laterally compressed anterior part, made up of the head, thorax and its appendages, and a posterior part, consisting of the abdomen with its swimming paddles [pl.43, fig.7]. The length of pupal life in all observed specimens was about four days. During this time the pupa would remain quietly floating with its thorax nearly vertical, its abdomen bent under, unless disturbed, when it propels itself to the bottom by means of the violent contractions of the abdomen, after the fashion of a crawfish. The specific gravity apparently being less than water, however, it requires a constant effort to remain at the bottom.

The head is bent down under the thorax, the antennae folded back arcuate and lying along its sides; the legs folded up in a sinuate fashion; the wings extending downward and backward from the sides. Near the highest point of the thorax, the pupa occupying its usual vertical position [pl.43, fig.7], are the two breathing trumpets, elongate, subcylindrical tubes, open and somewhat flaring at the top [pl.44, fig.11]. On the dorsal surface near the posterior margin of the thorax, are usually a pair of stellate hairs. The abdomen has eight segments, subequal in length except the first and last two, which are shorter, and on the posterior margins of which are a few tufts of branched hairs. Attached to the last segment is a pair of broad swimming paddles, each reinforced by a stout longitudinal rib, and ending in a single short spine. Between the paddles is a furcate fleshy process in which are contained the genitalia of the inclosed imago. The shape of this fleshy process differs with the sexes, and perhaps also with the species. The pupae of all the species I have examined resemble one another so closely that I have been unable to distinguish them. It appears however that there

are slight constant differences in the form of the air trumpet and in the number and arrangement of the abdominal hairs. Fresh specimens should however be examined in order to characterize them correctly.

The arrangement of the bristles on the abdomen is about the same in all the species examined. On the dorsal surface of the first abdominal segment are a pair of conspicuous stellate hairs, the remaining segments each have about three pairs of lateral discal hairs, and two pairs of small, branched, marginal ones; one of the marginal pairs of the eighth segment being many branched. Besides these there are usually a few scattered hairs.

Much has been written about the species of this genus, but the fact that most of the older descriptions are inadequate renders the synonymy much involved. Coquillett has done the best and most recent work on the North American species; and the reader is referred to his papers published by the United States Department of Agriculture, or, better still, to his table given in Howard's book on mosquitos, for the determination of the adults. In the last mentioned work will be found a most complete description of the life history of several species of mosquitos. The recent work of Theobald is a monograph of the Culicidae of the world.

Dr Dyar has recently published in the Proceedings of the Washington Entomological Society (1902 and 1903) and in the Journal of the New York Entomological Society (1902 and 1903) the descriptions of the larvae of a number of species of *Culex*, together with keys for their identification. The following key is adapted from one given by him, modified to include species more recently described.

KEY TO SPECIES OF CULEX LARVAE

- 1 Without a longitudinal row of spines on the air tube; hair tufts of anal segment confined to the barred area; seventh segment with a round dorsal plate incised anteriorly.....
signifer Coq.
- With a longitudinal row of spines or hair on the air tube.....(2)
- 2 Air tube at least four times as long as its breadth at the base(3)
- Air tube less than three times as long as broad.....(9)
- 3 Antennae with hair tuft beyond the middle of the joint.....(4)
- The antennal tuft at or before the middle.....(8)
- 4 Air tube six or more times as long as broad; antennae white banded(5)

- Air tube 4 or 5 times as long as broad.....(6)
- 5 Tube concave, the tip wider than the terminal portion.
 Spines of tube mostly with a single basal branch.....*territanus*
 Tube regularly tapered, smallest at the tip. Spines of the
 tube 3 to 4 branched.....*nigritulus*
- 6 Anal segment without hair tufts anteriorly of the trans-
 versely barred area.....(7)
 Anal segment with hair tufts on the ventral line up to the
 base*dyari*
- 7 Lateral comb of the eighth segment a patch of spines; tube
 brown*pipiens*
 Lateral comb a row of bars; air tube black.....*melanurus*
- 8 Apex of the labium rounded [pl.44, fig.1]. Antennae whit-
 ish on basal half.....*restuans*
 Apex of labium pointed [pl.45].....*cantans*
- 9 Lateral comb of the eighth segment a patch of small spines
 three or more rows deep.....(10)
 Lateral comb a few spines on a single or partly double row.....(13)
- 10 Anal segment with hair tufts before the barred area.....(11)
 Anal segment without tufts before the barred area.....(12)
- 11 The spines of the air tube prolonged into setae; tube about
 three times as long as wide; the antennal tuft is at the mid-
 dle of the joint.....*consobrinus*
 The air tube with spines, anal segment broadly plated..*canadensis*
- 12 Antenna with a small tuft a little before middle of the joint.
 Air tube about two and a half times as long as wide;
 lateral comb about three rows deep.....*bimaculatus*
 Antenna with a single inconspicuous hair instead of a tuft.
 Air tube not over twice as long as wide; lateral comb
 about five rows deep.....*atropalpus*
- 13 Anal segment with hair tufts before barred area.....(14)
 Anal segment without tufts before barred area.....(16)
- 14 Comb of eighth segment of separate nearly simple spines,
 the spines of the air tube each with three teeth.....*sylvestris*
 Comb of eighth segment either toothed or digitate.....(15)
- 15 Comb of eighth segment composed of spines with finely digi-
 tately divided tips; antenna with a single long seta instead
 of a tuft.....*triseriatus*
 Comb of conspicuously toothed spines, joined on a weak
 basal plate. Antenna with a small hair tuft.....*jamaicensis*
- 16 Comb of eighth segment of nearly simple, thorn-shaped
 teeth*sollicitans*
 Comb of eighth segment of pectinated spines in an incom-
 plete double row.....*taeniorhynchus*

The pupae resemble each other so closely that I have been unable as yet to find satisfactory characters to distinguish them.

Culex restuans Theobald

Plate 44

Monogr. of Culicidae, II:142

Male. Length 4.5 to 5 mm. Uniformly fuscous. Palpi as in plate 44, figure 12. The thorax is apparently marked with stripes; bases of the abdominal segments with yellow scales; bases of the femora and the tips of the tibiae yellow. Tarsal claws of the fore and middle legs unequal, each with a tooth, hind claws simple. Male genitalia resemble those shown on plate 43, figure 11; but the apex of the terminal claw is sinuous, and with a tiny hooked appendage. Wings hyaline, with fuscous scales. Venation as in figure 9. Halteres pale.

Female. Palpi as shown in figure 13. All tarsal claws simple. Venation of the wing as in figure 10. In other respects like the male.

Described from alcoholic specimens obtained from Professor Needham. Bred. Saranac Inn N. Y., July 21, 1900.

Larva. Length 7 to 8mm. The head is round, widest at the eyes, slightly wider than long, with six moderately long hair tufts in a transverse row immediately back of the antennae; the antennae slender, uniform, and brown in color but paler at the base. On the shaft is a tuft of 10 to 12 long hairs, a little below the middle, and at the tip are three slender and one stout spine and the stout apical joint. Rotatory fans normal. The mandibles have immediately above the teeth a long, stout spine with a serrated inner margin. The maxillae possess a pair of moderately long dorsal spines. The cephalic margin of the labium is arcuate, with about 23 teeth, besides three on each lateral margin [pl.44, fig.1]. The epipharynx is of the usual shape, though its lateral spines are somewhat longer than the median [fig.6]. The hypopharynx has a toothed margin and eight spines, four on each side, two lateral lobed processes each with six fingerlike projections and a median piece with a lobed margin [fig.5]. The labrum [fig.8] is hairy as usual, the clypeus [fig.8c] with two stout spines on its dorsal surface. On the gula are two trifid hairs. The thorax is rounded, and at the base of the larger tufts of hair are spurlike processes with four or five teeth projecting cephalad. The long, loosely feathered hair tufts of the thorax consist of the usual anterior transverse row, and the two lateral groups [fig.3]. The hairs of the abdomen are arranged in tufts of about equal length, though there are fewer hairs in the posterior ones; air tube brown, of moderate length, the row of lateral spines on it each with from 15 to 20 spines; caudad of which are a few long hairs. The lateral combs of the eighth

abdominal segment with 30 to 32 teeth arranged in about three irregular rows. Caudad of this comb is a tuft of nine feathered hairs, and dorsad and ventrad of it are several small bristles. On the dorsal margin of the ninth segment are three or four long bristles, and on the apical third of the ventral surface is a brush of long hairs consisting of from nine to 12 tufts. In most specimens the blood or tracheal gills are long, extending beyond the tip of the breathing tube.

Pupa. The breathing trumpet [fig.11] is somewhat widened at the top, about five times as long as wide, its apical margin oblique. On the most posterior of the thoracic sclerites are three pairs of short, stout, branched hairs; on the dorsal surface of the first abdominal segment, are the usual pair of stellate hairs; the remaining segments each have about three pairs of lateral discal hairs and two pairs of small branched marginal ones, one of the marginal pairs on the eighth segment being many branched.

Culex pipiens Linnaeus

Plate 43

Male. Length 4mm. Antennal joints grayish white, the tips black, the long hairs brown; proboscis and palpi pale fuscous, the latter darker at the tip with long, dark brown hairs; occiput with yellowish hairs; dorsum of thorax yellowish brown, with five indistinct, darker brown stripes, on each of which is a row of a few black or brown bristles, elsewhere covered with yellow scales; pleura metanotum and scutellum yellowish brown, the last slightly darker, with a few long brownish hairs; abdomen long haired, segments fuscous, at the base rather widely fasciated with yellow scales; ventral surface paler fuscous; genitalia yellowish, not very prominent [fig.11]; legs fuscous, quite pale on the coxae and base of femora, gradually becoming darker distally, the tarsi being quite dark; the knees and extreme tip of tibiae, yellowish. The fore and middle pairs of claws unequal, the longer one inside, each claw with a distinct tooth [fig.8]. The hind claws simple. Wings hyaline, scales fuscous [fig.10]. Halteres pale.

Female. Length 4mm. Antennae, proboscis and palpi uniformly fuscous; abdomen fuscous, with a very narrow basal fascia of yellow scales on each segment; ventral surface paler; femora with basal half and flexor surface yellow, gradually becoming darker distally, tibiae and tarsi as with the male. All tarsal claws simple [fig.9]. Wings with fuscous scales. Venation as in figure 12. All else as with the male. Bred specimens. July 18, Aug. 31, and Sep. 7, 1901. Ithaca N. Y.

Larva. Length 7 to 8 mm. The head is nearly circular in outline, color pale fuscous, with six moderately long tufts of hair on

the dorsal surface, the lateral ones near the base of the antennae, the others more caudad [fig.2]; eyes large; antennae flattened, wider on the portion below the hair tuft, which is composed of 20 to 30 loosely feathered, long hairs on the side at about two thirds its length from the base; its apex with four slender and one stout bristle besides the short apical joint. The rotatory fan [fig.5f], labrum [*l*] and epipharynx [*e*] normal; clypeus with the usual pair of setae; the mandibles with a long, stout, curved, pale brown spine with a serrate inner margin, projecting beyond the black teeth. A pair of small spines are found on the dorsal surface of the maxillae, and a small seta near the apex [fig.4x]. The cephalic margin of the labium [fig.4l] is elliptic, the median tooth longer than the others, and the hypopharynx [*h*] is of the usual shape [pl.44, fig.5]. The thorax is rounded; arranged on the dorsal surface in a transverse row near the cephalic margin are 10 or 12 equally spaced tufts of long hairs, the median tuft largest. A little caudad of the middle line, near the lateral margin are six or eight long hairs in an irregular transverse row, and on the lateral posterior margin, are two tufts of five or six short hairs each. The outline of the abdomen presents a sinuous margin, the segments being somewhat constricted at the incisures. On the prominence of each side of the segments are three or four moderately long hairs. The lateral combs of the eighth segment consist of a patch of about 50 spines. Caudad of the lateral comb is a tuft of about eight feathered hairs, and dorsad and ventrad of this is another smaller tuft. The ninth segment has five or six long setae on the dorsocaudal margin, 13 or 14 branched hairs of about six branches each on the caudal third of the ventral surface and four rather long sharply pointed blood or tracheal gills. The breathing tube is rather long, with from 10 to 15 serrate spines in a longitudinal row on each side, and on the ventral surface are three pairs of long and several short tufts of hair.

Pupa [fig.6, 7]. The breathing trumpet is comparatively long, widest at the apical third, its opening extending downward on one side to almost the middle. On the abdomen are the usual bristles, those on the lateral margin being larger toward the caudal end. Swimming paddles are of the usual shape.

***Culex cantans* Meigen**

Plate 45

Syst. Besch. 1818. 1:6, 2:6

1848 *C. stimulans* Walker. List etc. Synonymy according to Coquillett.

Male. Length 7 or 8 mm. Antennae with long fuscous hair; proboscis and palpi yellowish brown, the latter

with a band of dark scales near the base; joints dark; occiput with yellowish white scales; thorax with a black or brown ground, thickly covered with short golden yellow hairs, with five narrow longitudinal stripes of white scales. The lateral stripes are not parallel with the intermediate pair, but, starting anteriorly quite close together, diverge rapidly and end near the base of the wing. The white stripes are frequently quite indistinct, in which case the thorax might be described as having two rather wide yellowish stripes; pleura and scutellum with whitish hairs; metanotum brown and bare; each segment of the abdomen dorsally with its anterior third covered with short, whitish scales, which extend also in a narrow more or less broken line along the lateral margin. Posterior part of the segments is black with an occasional paler scale, particularly on the posterior margin. The last segment is nearly covered with white scales. Venter with yellowish white scales, which are rather thickly interspersed with long, pale brownish hairs; hypopygium prominent, black; flexor surface of the femora white, extensor surface sprinkled with brown; flexor surface of the tibiae and metatarsi yellow, extensor surface brown; tarsi black with the basal third or fourth white. Claws all with a tooth on the underside of each. One claw of the middle foot is much longer than the other and is sinuous in outline [fig.10]. Wings hyaline with blackish scales and a sprinkling of paler ones. Fourth tarsal joint of the male short. Venation as in figure 9. Halteres white.

Female. Antennae pale brown; proboscis fuscous; venter of abdomen without long hairs; genitalia black; anterior femora and tibiae brownish, with scattered whitish hairs; fore and middle tarsal claws with a single tooth, hind pair simple. In all other respects like the male.

Larva. Length 11 to 12 mm to the tip of the breathing tube. The head is dark brown, antennae with two slender and two stout apical setae and a short terminal joint; at a little below the middle is a tuft of about eight hairs, and on the shaft are a number of short, thick spines. The color of the antennae is a uniform dark brown. The rotatory fans are rather long, the individual hairs are noticeably pectinate at the tip. The mandibles, maxillae and labrum are normal, the latter apparently without the pair of dorsal spines, possessing a long, thick tuft of hair apically and a comparatively large palpus. At the base of the palpus on the triangular sclerite is a stout spine, and caudad and mesad of this is another, placed close to the suture which separates the lateral from the ventral sclerites of the head. The labium resembles that of *C. triseriatus* but

is somewhat more rounded, the middle tooth prominent. The thorax is transversely oval, with three or four rather short, stout setae on the cephalolateral margins, caudad of which and near the lateral margin is a tuft of short hairs; on the middle of the lateral margins are two tufts of feathered hairs, and caudad of this is another pair. The abdominal segments are slightly constricted at the incisures; the first segment has three or four long feathered hairs on each side; the rest of the segments each have about two on each side, besides some short, scattered ones. The lateral combs of the eighth segment have 35 or 40 teeth each. The ninth segment has a tuft of about 16 dorsocaudal bristles, one of them longer than the rest, and on its ventral surface are about 16 tufts, the first four somewhat separated from the rest and from each other. The dorsal surface of the segment is covered by a brown chitinized saddle. The tracheal or blood gills are of moderate length. The breathing tube is long, about four or five times as long as wide; with 20 or 25 lateral serrate spines in the longitudinal row, the basal four or five being smaller than the rest.

Pupa. The pupa greatly resembles those of the other species. The breathing trumpet widens at about one third the distance from the base, its open end only slightly oblique.

Described from a number of bred specimens. May 1901. Ithaca N. Y.

***Culex sylvestris* Theobald**

Monogr. Culicidae. 1:406

This species will fall in the same couplet with *C. stimulans* Walker (= *C. cantans* Meigen), in the key given in Dr Howard's book on mosquitos (1901 ed.). It is apparently not uncommon and has probably heretofore been confused with the above mentioned species. It greatly resembles *C. cantans*, it also agrees fairly well with the descriptions of *C. vexans* Meigen and with Walker's description of *C. stimulans*. From the first it differs in having (in *unrubbed*, bred specimens) an unmarked thorax, and in having only the immediate bases of the tarsal joints white. The male also has the long claw of the middle foot slightly curved but not sinuous [*compare* pl.45, fig.10 and pl.40, fig.11]. From *C. stimulans* it differs in having the posterior fork cell wider and shorter than the anterior, while in *stimulans*, according to Giles, they are "of about equal length and breadth." From both

of the foregoing and from *C. vexans* also, the male differs in having a white band on the middle of the long second joint of the palpus. In spite of the tooth on the underside of the hind claws I believe my identification is correct.

Male. Length 5mm. Antennae with long fulvous hairs, proboscis and palpi dark brown, the latter with a white band on the middle of the long second joint, and the bases of the third and fourth joints white. The occiput with golden yellow hairs and patches of blackish and whitish scales; dorsum of the thorax with a black or brown ground uniformly covered with golden yellow hairs, the posterior margin and the scutellum with a fringe of longer yellow hairs; metanotum light grayish brown, bare; pleura brown with whitish scales.

Each segment of the abdomen dorsally with its anterior fourth covered with short white scales; posterior part of the segments black slightly produced forward in the center and the posterior margins of the next to the last whitish; the last one wholly black; genitalia brown, the apical joint slender with a spine near its apex [pl.40, fig.12]; venter pale brown with whitish scales; entire abdomen with long, erect pale brown hairs; femora brownish, the bases and the flexor surface of the middle and hind pairs and sometimes the front pair also, white; tibiae and tarsi brownish black, flexor surface paler; the immediate base (about one eighth of the length) of each joint of the tarsi yellowish white. The hind legs with erect, yellow setae. All tarsal claws with a tooth on the under side of each. The long claw of the middle foot as shown in figure 12. The venation is about as that shown for *C. cantans*, though the posterior cross vein is not oblique. Halteres yellowish white.

Female. Differs from the male only as follows. Antennae brown, basal two or three joints yellow; abdomen marked like the male, but the long hairs are only on the posterior margin of each segment; genitalia black, consisting of two fingerlike lobes; venter yellow with white scales, posterior margin of the segments black. Tarsal claws like the male.

Described from bred specimens.

Larva. The larva resembles that of *C. cantans*. The mandibles are like those shown on plate 45, though the teeth are more blunt; the maxilla is like that shown on the same plate, though the palpus is rather shorter than shown here, and there are two lateral spines. The labium is pointed, and the antenna has a tuft of bristles near the middle. The teeth on the sides of the eighth segment are arranged in one irregular row. The spines of the longitudinal row of the breathing tube each have

two or three short teeth near the base, the two or three elongate distal spines being separate from the others and from each other. Breathing tube about two and one half times longer than wide. The setae of the ninth segment extend forward from the barred area.

Pupa. The plane of the margin of the breathing trumpet makes about a 30° angle with its long axis. Specimens taken July 10, 1902, Ithaca N. Y.

Culex triseriatus Say

Plate 46

Acad. Sci. Phila. Jour. 3:12. 4 Compl. Wr. 2:40; Wiedemann, 1:11, 12

Female. Length $4\frac{1}{2}$ mm. Antennae uniformly grayish, the large basal joint yellowish, the joints of the flagellum verticillate, with a few long, black hairs, besides which the shaft is covered with sparse grayish white, downy hair; proboscis fuscous, including its base and the epistome. Palpi one fourth as long as proboscis, cylindric. Occiput covered with silvery white scales; dorsum of thorax with a very broad black stripe, widened posteriorly, where it covers the space to the base of the wing excepting a spot of white scales in the middle line on a line with the bases of the wing; scutellum and metanotum black; the sides of the anterior part of the dorsum, and the pleura, covered with white scales; abdomen covered with deep black scales. The anterior margin of the dorsal surface of the segments are fasciate with dark brown scales, and the anterior margin of all segments on the ventral surface fasciate with white scales. These latter fasciae extend to the sides and their extremities are just visible on the dorsal aspect. The last segment is yellow, genitalia black; the legs black, the coxae, the flexor surface of all the femora, the bases of the first and second pairs, the basal two thirds of the hind pair, and all the knees, white; tarsi sometimes dark brown. The fore and middle pair of tarsal claws each with a tooth, those of the hind pair simple. Wings smoky, the scales black, those on the posterior margin brown. Venation as in figure 7. Halteres white.

Male. Antennae wanting. Like the female in all respects excepting as follows. The black dorsal stripe slightly narrower; the long palpi are black, hypopygium prominent, the front tarsal claws of unequal size, one long and curved, the other shorter and nearly straight; both with a single tooth on the underside, the middle claws each with a tooth, hind ones simple. Described from specimens bred July 1901. Ithaca N. Y.

Larva. Length 7 to 8 mm. Head [fig.3] is round, in color brown; in the transverse row between the bases of the anten-

nae are six tufts of hairs, the median pair short; caudad of these is one pair of long setae, and directly caudad of each eye is a single one. The antennae [fig.1] have three or four apical bristles besides the usual small terminal joint, and a little distad of the middle is a single long seta. Labrum, rotatory fan and maxillae normal, the two dorsal spines of the latter rather longer than in *C. pipiens* and the papillae on the mesal surface are more prominent. The spines of the epipharynx as in *C. pipiens*, but the lateral ones shorter than the median pair. The stout apical spine of the mandible [fig.2] does not project beyond the tip of the teeth. The labium [fig.4], is triangular with 19 teeth, hair on its ventral surface, and caudad of the transverse suture are two pairs of setae. The hypopharynx, shown somewhat diagrammatically in figure 6, has a number of sharp teeth besides two lateral lobes with fingerlike processes (not shown in the figure). On the dorsal surface, along the cephalic margin of the thorax, are six or eight hair tufts, all rather short except the lateral ones, which are of moderate length; on the middle and on the posterior end of the lateral margin are two long tufts. Near the caudal margin are two stellate hairs. Each abdominal segment has, besides the long lateral tuft, four short dorsal tufts and a few short lateral and ventral hairs. The lateral comb of the eighth segment is composed of about eight spines arranged in one irregular row; the ninth segment but little longer than wide, is provided with a dorso-caudal tuft of 10 or 12 hairs, a ventral row of about 10 tufts, each tuft with four or five hairs. The blood or tracheal gills are comparatively short. The breathing tube is short, about twice as long as wide, with a lateral longitudinal row of 18 to 20 spines, at the caudal end of which is a single hair tuft.

Pupa. The pupa does not appear to differ from *C. cantans*. The air trumpet is widened at the top, the plane of the margin of the aperture makes about 45° with the longitudinal axis. Bred specimens. July 1901. Ithaca N. Y.

Genus *AEDES* Meigen

Small, brownish or blackish gray species closely resembling *Culex*, differing only in that both sexes have very short palpi. According to Van der Wulp, the palpi, though short as in the female of *Culex*, are not cylindric as in the latter genus, but conical or pointed, and consist of two joints only. But two species of adults are known from the United States.

A. fuscus O. S., Western Diptera. 1877. p.191. Cambridge Mass.

A. smithii Coquillett, Canadian Ent. 1901. p.260. New Jersey.

Imagines

These two species may be distinguished as follows:

With cross bands of yellowish scales at the bases of the abdominal segments.....	<i>A. fuscus</i> O. S.
Without these bands.....	<i>A. smithii</i> Coquillett

Larvæ

With four anal blood gills.....	<i>fuscus</i>
With two anal blood gills.....	<i>smithii</i>

***Aedes fuscus* Osten Sacken**

The larva is described by Dr Dyar in the *Journal of the New York Entomological Society* for 1902, page 197. This larva differs from that of *A. smithii* in having four long narrowly tapered blood gills instead of but two. The antenna has a tuft of hair a little before the middle; the breathing tube is about three times as long as wide; its spines are single toothed. The ninth segment has tufts before the barred area; the lateral combs of the eighth segment consist of a single irregular row of rather coarse spines.

"The pupa is normal, its air tube cylindrical, slightly bent but not widened into funnel shape."

***Aedes smithii* Coquillett**

Plate 47, fig. 1-6

The adult is described by Coquillett in the *Canadian Entomologist*, 1901. Of the life history Prof. J. B. Smith has discovered the following:¹

"The female *Aedes* lay their eggs in the newest leaves of the pitcher plants (*Sarracenia*), and do not always wait for water to collect in them. Of the specimens of larvae which he had taken during the winter the last one changed to the pupal state about Sep. 9; thus being in a larval state since the preceding October. He thought that there were about three broods, and that the different specimens vary in their time of appearing, which seems to give one continuous season."

The larva has already been well described by Dr Dyar, in *New York Entomological Society Journal*, December 1901, page 178, plate 10, figure 1. It greatly resembles the larva of *Culex*, this species differing from the known members of that

¹Ent. News. 1901. p.254. See also N. Y. Ent. Soc. Jour. March 1902.

genus in the following particulars. The mandible has but one large bristle or curved spine at the apex (in all specimens examined); the papillae of the maxillae are elongate and sharply pointed; and the blood gills at the posterior end are only two in number.

The characters of the species are as follows: Head rounded, somewhat flattened; eyes very small, round, and black; rotatory fan conspicuous; antennae slender, uniformly pale in color, the lateral tuft represented by a single seta, its terminal appendages short, consisting of two or three slender setae, a blunt spine and the usual short terminal joint [pl.47, fig.1]. The mandibles [fig.2*m*] are shaped like those of *Culex* but appear to have but one stout, curved seta at the apex; the bearded process caudad of the teeth has a stouter base than in *Culex*; maxillae [fig.2*x*] elongate, pointed papillae and several terminal setae besides the usual long hairs. The labrum resembles that of *Culex*, the clypeus with a pair of rather elongate blunt spines. Epipharynx as in *Culex*, though with but two instead of four spines. The labium triangular with a long central tooth and nine teeth on each side of this [fig.2*l*]. The gula is apparently without setae. On the dorsal surface of the head between the bases of the antennae in a transverse row are four small setae, and caudad of each of the two inner ones is another. Thorax quadrate, wider than long, lateral margin sinuous; dorsal hairs short, those of the three lateral groups long; abdomen slender, segments subequal in length, the long lateral hairs about of equal length, those on the anterior segment, four to six in number, diminishing in number caudad, so that on the last two segments there are usually but two on each side. The dorsocaudal and ventrocaudal tufts short and composed of two or three hairs. The lateral combs of the eighth segment consist of 15 to 20 stout teeth arranged in a single somewhat irregular transverse row. The air tubes rather short, about three times as long as its greatest diameter; with four rows, each with five or six long setae [fig.6]. The two longitudinal rows of teeth which are present in *Culex* are entirely wanting. The anal segment is short, with two inflated translucent blood gills and with dorso-caudal, laterocaudal and ventrocaudal tufts of long hairs; the ventral brush wanting.

The pupa has the posterior margin of the swimming paddles ciliate with short hairs instead of terminating with a single bristle as it does in *Culex*. Near the anterior margin of the thorax is a pair of long setae, caudad of which are two pairs of short forked hairs. The breathing trumpet [fig.4] is like

Culex, the plane of the margin being about at right angles with the long axis of the tube. On the dorsum of thorax is a pair of short forked hairs just caudad of the trumpet; on the metathorax is a transverse row of slender setae, and caudad of the base of the posterior margin of the wing are five or six rather long setae. The two stellate hairs on the first abdominal segment are very conspicuous. The rest of the segments each with a few subdorsal hairs; on the posterior end of the lateral margin of segments 4, 5 and 6 is a single long one, and on 7 and 8 a conspicuous fan of hairs [fig.5]. The swimming paddles are rather small and with cilia on posterior margin. The thorax in mature specimens is dark brown, the abdomen paler.

Described from specimens kindly furnished by Prof. John B. Smith.

Genus *URANOTAENIA* Arribalzaga

This genus possesses in most respects the same characteristics as *Culex* and *Aedes*; it differs from *Culex* however in having short palpi in both sexes, agreeing in this with *Aedes*, but differs from the latter in having violet blue scales on the thorax. The palpi of both sexes are two jointed, the basal joint globular, nearly as large as the basal joint of the antennae, the apical joint small, conical and pointed; differing thus from the cylindric palpi of the female *Culex*.

Uranotaenia sapphirina Osten Sacken (*Aedes*)

Plate 46, fig. 8-15

Am. Ent. Soc. Trans. 2:47

"Wings unspotted; abdomen dorsally brownish, thorax tawny brown with a median dorsal, and three lines on the pleurae, metallic blue; tarsi brownish, unbanded." Description of Osten Sacken. 1868. 2:47. "Fuscous, the frons, a median thoracic line and stripes on pleurae metallic blue; bases of coxae and femora pale; apices of the femora and tibiae snowy. Front blackish, with a metallic blue reflection along the eyes, specially in the middle. Antennae blackish, scapus tawny; those of the male apparently 15 jointed (13 plus two), flagellum with 12 beautifully bearded joints; a 13th elongated, linear joint has some scattered hairs, but no beard like the preceding ones. Proboscis long, reaching in the male if bent backward, to about the middle of the abdomen; rather conspicuously incrassated at the tip; perhaps still longer in the female (abdomen of my female injured); thorax brownish, tawny, darker above, paler on the pleurae; a metallic blue longitudinal line along the middle of the thorax reaches the scutellum; three similar marks on the pleurae, the upper of which is in the shape of a short line run-

ning from base of wing toward the head. Abdomen brownish above, paler below; knob of halteres brown, stem pale. Feet brownish paler at the base; a snow-white dot on the upper side of tip of femora and of tibiae; when looked at very obliquely, these white dots appear slightly pale bluish, and the tibiae and tarsi likewise show a faint bluish reflection. Wings clothed with brown scales, but showing in an oblique light numerous blue reflections, especially a stripe near the basis between the third and fourth longitudinal veins. Obs.—In female specimen the scales are rubbed on the feet; therefore appear pale tawny; still, white dots are distinctly visible. Length 3mm. Wing 3mm. Habitat United States, Washington D. C., Brooklyn N. Y.”

To the above I may add that in well preserved specimens the abdomen has a very narrow, pale posterior margin, and that the female also possesses the white spot at the tip of the femora, rather faint, and at tip of tibia very distinct. The tarsal claws of both male and female are simple, the middle tarsi of the male with but a single large strongly curved claw [fig.15]. The claws of the hind legs small and but slightly curved. Wing venation as in the figures [fig.13 female, fig.14 male]. The hypopygium of the male, moderate sized with the jointed appendage slender and curved up at the tip [fig.12]; its ventral tooth simple.

[Pl.46, fig.8-15]. The larva and pupa, and the life history of this species are described by Dr Dyar.¹ According to the figures and description given by Dr Dyar, this species differs from the known members of the genus *Culex* in the following particulars: “Antennae moderate, divergent [fig.10]. The hairs of the thorax and abdomen [fig.8] black, the thoracic ones equal, long; those of the first and second abdominal segment also long; but the rest very short and inconspicuous, stellate. The lateral comb [fig.9] of the eighth abdominal segment is a large plate with a row of stout teeth on the posterior edge . . . air tube rather short, not longer than two segments, widened at the tip by four distinct, flattened teeth, as long as the width of the tube; last segment moderate, with the usual four anal fingers (blood gills). Pupa essentially as in *Culex*. . . Segments dorsally

¹N. Y. Ent. Soc. Jour. 1901. 9:179.

tufted with stellate hairs and some small tufts about the eyes and between the prothoracic air tubes. Tubes long, slender, uniform in width, not flared, but slightly bent in the middle, about 12 times as long as wide."

Family DIXIDAE

Dixa midges

Plate 48

These little flies closely resemble mosquitos in size and form; but may easily be distinguished from them by the venation of their wings, and in that the veins are not furnished with scales [pl.48, fig.8]. The antennae are about 15 jointed, and differ but slightly in the two sexes; the legs are long and slender; and the caudal end of the abdomen of the male is enlarged. The family includes only a single genus, *Dixa*. The flies appear to be rare in America; at any rate are rarely observed.

The larvae of several European species are known. The following is the first published description of the larva of an American species, as far as I am aware.

Dixa modesta ^{*modesta* Will.} nov. sp.

Mr Henshaw kindly compared this species with Loew's types in the Cambridge Museum and he found that it differs from all of them.

Male and female. Brown, dorsum of the thorax between the dark stripes yellowish; scutellum, middle and hind coxae, and tip of the abdomen either yellowish or pale brown. Length 2 to 2.5 mm.

Head dark brown, including palpi, antennae, and proboscis. Thorax including the pleura, metanotum, and sternum, brown; dorsum yellow with three wide brown stripes, scutellum yellowish or pale brown. Abdomen dark brown or black, venter a little paler, last segment yellowish, tip of genitalia black. Legs brown, middle and hind coxae yellowish, and the basal portion of the femora more or less yellowish brown, the tarsi and the tips of the tibiae almost black. Wings hyaline very faintly cinereous, veins fuscous, cross vein not clouded; the peduncle of the Cubitus about as long or but little longer than the fork. Venation as shown in figure 40. ♂

Described from a number of captured and bred specimens. April and October 1902. Ithaca N. Y.

Larva. The larva is found in pond water or in slow flowing streams. It is almost always bent double in the shape of a letter U [fig.5], so that the head and tail come close together; the bend being at the sixth segment. When kept in a tumbler of water, it will lie on the side of the glass with its body above the water level; its head and tail toward the water. It appears however that it is still within the surface film. Its general color is a pale fuscous with black head and appendages. The body consists of three thoracic and eight abdominal plus the anal segment. The head [fig.1] is somewhat quadrangular in shape, with the antennae at the anterior lateral margins. On the dorsal head sclerite are three pairs of setae arranged as in figure 6; and on the ventral surface are also three pairs besides a smaller one at the base of each antenna, as shown in figure 1. The antennae are slender, slightly curved, and deep brown in color, with numerous sharp, distad projecting tubercles or spines. The labrum is attached to the cephalic margin of the dorsal sclerite [fig.6] and hangs flaplike over the mouth. The margin is heavily fringed with dense tufts of hair which appear to act as rotatory organs. Ventrad of this are the mandibles [fig.2], short and stout, each with a curved spine at its cephalic end, a pair of curved setae on its outer (lateral) margin, and a row of fine, curved hairs overhanging the two short, sharp teeth in its inner (mesal) margin. The maxillae are ventrad of the mandibles, and are well developed. At the apical end of each are a few fine, curved hairs [fig.3], and on its outer surface are short, scattered hairs. Its palpus [fig.3p] greatly resembles the antenna, but is a little smaller. On its basal joint is a stout seta. The labium is semicircular in outline, with hairs on its apical margin, but apparently without teeth.

On the dorsal surface of the first thoracic segment are a few long, cephalad projecting setae, and a few shorter ones on each of the following thoracic and abdominal segments. The first two abdominal segments each have anteriorly on the ventral surface a pair of short prolegs with rows of short, curved bristles [fig.5c]. The ventral posterior margin of each of the eighth, ninth, and tenth body segments (fifth, sixth and seventh abdominal segments) is a fringe of stout caudad projecting bristles [fig.5b].

The appendages of the last segment of the abdomen superficially resemble those of *Anopheles*. The spiracles open on the dorsal surface [fig.7s], and surrounding each of these and extending laterad is a leaflike plate with a ciliated margin. Immediately cephalad of these is a transverse row of six short branched hairs. Extending caudad are two long, dark brown

fingerlike lobes, each with a marginal fringe composed of a single row of stout setae; and lying between these is a third, cylindric, nearly black in color, provided apically with three pairs of long black setae, and a short, pale yellow terminal joint [fig.7]. The middle lobe does not extend quite so far caudad as do the lateral lobes, differing in this respect from the described (European) species. It is a little more than twice as long as wide. Of the four small respiratory gills figured by Meinert in *De eucephale Myggelarver* nothing is to be seen in the specimen from which the drawing was made, though they are present in specimens discovered later. Caudad of the spiracles and lying on the dorsal surface is a triangular chitinized plate, the rounded vertex pointing cephalad, the basal angles each provided with a single short seta [fig.7p]. On the ventral surface, at the base of each of the long lateral lobes, is a short, semicircular lobe with a marginal row of short, black spines [fig.5a]. On each side of the middle line and caudad of the small lobes is a black ridge or keel with two black setae, the longer one projecting caudad, the shorter one projecting laterad; and extending transversely between the bases of these setae is a matted fringe of fine, pale yellow caudad projecting hairs.

Pupa. The pupa [fig. 4] is pale fuscous. The single observed specimen assumed a nearly circular position, its caudal end nearly touching its head, and remaining motionless on the side of the glass above the water film. Normally a *Dixa* pupa rests on its side, and according to Meinert it may thrive either in or out of water. The length of pupal life is about three days. No setae were observed on any portion of its body. The breathing trumpets are short, with widely flaring conical mouths. There are eight abdominal segments besides the anal one. The anal segment has two long, pointed lobes with very finely serrate margin and a few short, terminal hairs.

The larva on which this description is based, was found in Ithaca N. Y. in a slow flowing stream Ap. 11, 1902; it pupated Ap. 18, and emerged three days later. A number of specimens were found in October.

KEY TO SPECIES OF *DIXA*

In order to facilitate identification, the following key is offered, which must however be used with caution, as it is in part compiled from descriptions.

- 1 Species having both the proboscis and the scutellum yellow.....(2)
- Having either proboscis or scutellum black.....(4)

- 2 Knob of the halteres black. With the head, palpi, base of the antennae, thorax, venter and the legs except the tip of the femora, yellow. Length 2.7mm. Berl. Ent. Zeit. 1863. Centur. 3, p.1. District of Columbia.....*marginata* Loew
- Knob of the halteres yellow. With the head, antennae, palpi (except the base), thoracic stripes and part of the legs brown or black.....(3)
- 3 Cross vein with cloud. "The peduncle of veins R_2 and R_3 ^{very short} ~~very short~~. Female. Length 2.7mm. Berl. Ent. Zeit. 1863. Centur. 3, p.4. Maryland and New Jersey (Johnson) ^{very short} ~~notata~~ *notata* Loew
- Cross vein not clouded. Peduncle of this vein ~~as usual~~ ^{very short}; a little shorter in the male than in female. Length 2.5mm. Berl. Ent. Zeit. 1863. Centur. 3, p.3. New York and Ithaca N. Y. (= ? *D. recens* Walker).....*terna* Loew
- 4 Species having both the proboscis and the knob of the halteres black(5)
- Having proboscis and halteres of different colors.....(6)
- 5 Thorax with yellow space between the dark dorsal stripes. Ithaca N. Y. ^{tabulata} ~~modesta~~ *modesta* n. sp.
- Without yellow on dorsum. Blackish species. Lower part of the pleura, sometimes scutellum and metanotum, coxae and base of the femora, and stem of the halteres yellow. Male and female. Length 2.5 mm. Berl. Ent. Zeit. 1863. Centur. 3, p.5. New York.....*fusca* Loew
- 6 With yellow rostrum; halteres with a fuscous head. Head, palpi, antennae, thoracic and pleural stripe, abdomen and tip of femora wholly black; tarsi fuscous. Length 3 mm. Male. Berl. Ent. Zeit. 1872. Centur. 10, p.1. Texas.....*venosa* Loew
- With black proboscis; halteres yellowish; palpi and proboscis and tips of femora and tibia black.....(7)
- 7 Antennae and scutellum black; pleura and metanotum black; and tarsi and abdomen fuscous black; halteres sordidly yellow. Male 2.7 mm. Berl. Ent. Zeit. 1863. Centur. 3, p.3. New York, (= *D. nova* Walker?).....*centralis* Loew
- Antennae yellow at the base, flagellum pale fuscous, scutellum fuscous testaceous; tip of posterior tibiae thickened. Metanotum black with yellow margin; abdomen shining cinereous black; tarsi black toward the tip. Male and female. Length 4.2 mm. Berl. Ent. Zeit. 1869. Centur. 8, p.1. Massachusetts*clavata* Loew

Family CHIRONOMIDAE

This family is exceedingly rich in species. Owing to the fact that the life history of comparatively few is known, it is difficult to give a key even to the genera of the larvae and pupae. The Chironomidae may be divided into three groups, the first

containing Chironomus and allied genera, the second containing Tanypus and some others, and the third, Ceratopogon etc. Besides this, there are a few aberrant genera which can not well be placed in any of the above mentioned groups.

The bibliography of the biologic literature is rather extensive, specially for European species; and I will therefore give only that which may be of particular interest to the American reader.

- Brauer, F.** Syst. Studien auf Grundlage der Dipteren-Larven nebst einer Zusammenstellung von Beispielen aus der Literatur ueber dieselben und Beschreibungen neuer Formen. Denkschr. d. k. zoo. bot. Gesell. Wien. 1883. 47:1-100, pl.1-5
- Fries.** Monographia Tanyporum Sueciae. 1824
- Gercke.** Verh. Ver. Hamburg. 1877. 4:6, and 1880. v.6
- Kieffer, J. J.** Allgemeine Zeitsch. f. Ent. Aug. 1901. Ceratopogon and Wulpiella
- Meinert, Fr.** De eucephale Muggelarver. With extensive bibliography. 1886
- Miall & Hammond.** The Harlequin Fly. On the Life History and Anatomy of *Chironomus dorsalis*. With bibliography. 1901
- Packard, A. S.** On Insects Inhabiting Salt Water. Am. Jour. Sci. no. 2. 1871. Species of Ceratopogon (nec Tanypus)
- Essex Inst. Proc. 6:42. *Chironomus oceanicus*
- Pettit, R. H.** Mich. Acad. Sci. 1900. p.110. A Leaf-mining Chironomus
- Osborn, H.** Iowa Exp. Sta. Bul. 32. Chironomus Larva
- Smith, Sidney.** United States Fish. Com. v.2, Rep't for 1872 and 1873. Sketch of the Invertebrate Fauna of Lake Superior. Larva of Chironomus

The Chironomidae are gnatlike flies of slender form, the males conspicuous for their plumose antennae. They may be distinguished from mosquitos, which they resemble very much, by the costal vein not being continuous on the posterior side of the wing. The larvae are soft skinned, wormlike, and usually aquatic, though some are terrestrial. These midges are often seen, specially in the early spring or in the autumn, in immense swarms, dancing in the air. For a more complete characterization of the family the reader is referred to Comstock's *Manual for the Study of Insects* or to Williston's *Manual of the North American Diptera*.

Gereke, in *Verh. Ver. Hamburg*, 1878, 4:225, distinguishes the larvae of Chironomus and Tanypus thus: "All Chironomus larvae have a cylindrical body, a short oval head; the smaller spe-

cies yellowish in color, often colorless; the larger ones often a deep red. All *Chironomus* larvae build a cylindrical, gelatinous, or silky case, in which they usually are hidden. The larvae of *Tanypus* possess a distinctly segmented, somewhat flattened body, with long conical anal prolegs, an elongate triangular head, with distinct eye spots. They do not appear to build a larval case." Those *Ceratopogon* which in the adult state do not possess hairy wings, have aquatic larvae. These are very elongate, snakelike in form, with a conical head, no thoracic or caudal appendages, save sometimes a few bristles at the tip of the last segment.

The pupa of *Chironomus* usually lies hidden in the larval case, keeping the water surrounding it in circulation by the undulating motion of the abdomen. The pupa of *Tanypus* is active and resembles that of *Culex*. The pupa of *Ceratopogon* is more elongate than that of *Tanypus*, and is not active, but floats nearly motionless, with its body in a vertical position.

For determining the genera of the imago, the table given by Williston in his *Manual of the North American Diptera* is most useful.

Chironomus (sens. str.) sp.

Plate 49

A large number of larvae and pupae were taken from the stomachs of brook trout, as has been described by Professor Needham in this bulletin. Many specimens were examined and all found to belong to the same species. The species evidently being of great importance as fish⁴ food, it is desirable that it may in the future be recognized, and therefore I herewith describe it. Many characters here given apply to the genus as well.

Body slender, 12 segmented, full grown specimens about 18mm in length. Occasionally, still living specimens were found within the fish stomachs; these possessed the brilliant red color so characteristic of certain *Chironomid* larvae. At the anterior end of the first segment and at the posterior end of the 12th are pairs of prolegs. The head is small, dark brown, heavily chitinized, a little longer than wide. The sclerites of the head consist of a dorsal, ventral and two lateral plates, besides a number of smaller ones. The dorsal sclerite resembles that shown on plate 50, figure 4; but there are three pairs of bristles

near the suture on the dorsal plate, the anterior pair quite close to the anterior margin [pl. 49, fig.8], and laterad of the posterior pair, lying close to the suture, but on the lateral plate is another ceta. The median plate carries the labrum [lr, fig.8], which hangs flaplike in front of the mouth and may be bent backward, and on its under surface are three pairs of setae. Attached to the labrum on its ventral surface is the epipharynx [fig.3e]. This is a complex structure attached at its anterior margin, its free margin projecting ventrad and caudad. On its surface are a number of spines, its margin is serrate and provided with three pairs of small serrate teeth. In addition to this is a pair of long, chitinized, sickle-shaped processes. The shape and the arrangement of the setae are as shown in figure 3. The lateral plates bear two pairs of rudimentary eyes (pigment spots), as well as the antennae and the jaws. The antennae [fig.2] are situated on the anterior end of the lateral plates; they are small, consisting of a comparatively long basal joint, on which are two terminal pieces, one four jointed, the other somewhat shorter and simple. The mandibles, situated ventrad of the antennae are stout and with a four or five toothed apical margin. Near the ~~base~~, overhanging the teeth, is a brush of hair [fig.6 *after 14* and fig.8m]. The mandibles are articulated in such a manner that they move in an oblique plane, striking the labium [fig.8l and fig.5l]. The labium is attached, or rather coalescent with the front margin of the ventral sclerite of the head, the suture separating this sclerite from the lateral ones only faintly marked. Miall & Hammond consider the ventral piece as a portion of the lateral sclerite. The margin of the labium is toothed, the three middle teeth somewhat shorter than those immediately laterad of them [fig.5l]. Near the base and ventrad of the mandibles are the maxillae, consisting of fleshy processes, with forward projecting teeth on the lateral margin; a bunch of slender lobes and setae on the inner margin; and a short stout palpus with some terminal spines and papillae [fig.5mx and fig.9]. On the ventral surface is a long stout seta. On each side of the labium is a striated and flexible fan-shaped flap which helps to close in the mouth [fig.5]. On the floor of the mouth cavity, lying close to the labium, is the hypopharynx. Its anterior margin is furnished with a number of short spines and bulb and platelike projections. This is the piece which Miall & Hammond, in their work on *The Harlequin Fly*, on page 29, call the upper plate of the labium, or mentum in the figure on page 30. Its function seems to be that of a guide for the silk thread, as is undoubtedly the case with *Simulium*. The prothoracic pair of feet [fig.4] are furnished with a large number of slender curved hairs, yellowish in color, the two feet

very close together so that they appear as one. The first three segments in specimens which are ready to transform are enlarged and represent the thorax; the intermediate segments are subequal in length and apparently without trace of setae. On the ventral surface of the 11th are two pairs of long blood gills [fig.7], on the caudal end of the dorsal aspect of the last segment are two tufts of five or six long hairs; ventrad of which is a bunch of four very short processes. The anal feet are about as long as the 11th segment, each one with a crown of 12 to 15 bifid claws, resembling the one shown on plate 50, figure 9, but sharper, straighter and more slender, and the inner one comparatively shorter, the angle between the two teeth being about 60° .

The pupa [fig.12] is elongate, its abdomen eight segmented, not counting the anal appendage. The usual respiratory filaments of Chironomus, consist of a pair of much branched tufts. On the lateral margins of each of the segments are a few delicate, transparent filaments [fig.10]; of these there are five pairs on the eighth segment, besides a pair of chitinized toothed claws. On the margin of the anal segment is a close row of hairs, the basal portions of which are stout, but extremely fine at the extremity, where they become matted, forming a paddle [fig.10, 12].

Of course no adults were found in the material, but from some nearly mature pupae the flies were withdrawn, and these possess the following characters. Length, 7 to 8 mm. Dorsum of thorax brown, with the usual three dark dorsal stripes; pectus darker brown; dorsum of abdomen paler brown, the incisures whitish; the ventral surface of each segment with a large, rectangular brown spot, the rest whitish; legs yellowish brown; the tips of all joints blackish. Metatarsus longer than the preceding joint; all tarsal claws simple. Male genitalia complex, consisting of two pairs of blunt lobes, the outer pair the longer; a pair of two jointed claws; and on the dorsal aspect is a single large, heavily chitinized, downward curved hook. Figure 11 shows a side view, the dorsal surface being turned uppermost. The colors given in the above description are doubtless intensified in the living fly. It is hoped that by means of this description the fly may later be recognized.

THALASSOMYIA Schiner

Plate 50, fig.1-15

Verh. Zool. Bot. Ver. 6:216, 1856

This is the first record of the genus from North America. As far as I am aware, but two species have been described, *T. frauenfeldi* Schiner and *T. congregata* Tomasovary,

both European species. The genus belongs to the group Chironomus (*sens. lat.*); but differs from all the other genera of this group in having the fourth tarsal joint shorter than the fifth [fig.14], resembling in this respect Tanypus, and Diamesa, from which it differs in the wing venation; the R-M cross vein wanting; antennae as in Chironomus.

T. obscura n. sp.

This fly was very common here during the past summer, the larva living on the rocky bottom of the shallow, swiftly flowing streams, where the water is but an inch or two in depth [pl.32], sometimes in company with Simulium; it spins a loose cocoon so open and transparent that the larva is not hidden by it, though it prevents the larva from being washed away.

Male. Front and epistome yellow, palpi fuscous, shorter than the antennae, its first joint about one and one half times as long as broad, the second twice, the third three times and the fourth about four times as long as the first. Antennae fuscous, 14 jointed, the first disklike, the second longer than broad, the third to the 13th about as long as broad, the 14th longer than all the others taken together; all furnished with long brown hairs except the apical one fourth of the 14th. Dorsum of the thorax blackish. Yellow on the humeri and pleura, covered with a white bloom, most conspicuous on the humeri. The dorsum of the thorax has a dirty yellow ground color but the three black longitudinal stripes are so wide that only a little of the ground color shows, excepting on the humeri and the two very narrow faint longitudinal stripes separating the three wide, black ones. The scutellum is chestnut; metathorax black; pectus brown; abdomen dull black, the dorsum of the first two segments greenish; the extreme edge of each segment, paler fuscous; the venter greenish, darker, almost black on the more posterior segments. The green is sharply separated from the dorsal color on a lateral line. In dried specimens this green color becomes dusky. Legs almost black, the coxae and bases of the femora yellowish, tarsal claws simple; wings hyaline, hairless, the anterior veins yellowish, the rest hyaline; venation as in the figure; anterior and posterior margin delicately ciliate; genitalia inconspicuous [fig.13, dorsal view]. Halteres white. Length 3 to 5 mm.

Female. Antennae seven jointed, black, with short hairs. Thorax with the black stripes a little narrower than in the male,

hence the yellow stripes separating them and those on the humeri, more conspicuous. Pectus, scutellum, and a little space in front of the latter, brown; the pectus in dried specimens sometimes nearly black; pleura yellow, metanotum black; abdomen as with the male, but the venter paler, legs black, coxae and base of femora yellow; tarsal claws simple; wings hyaline, anterior margin and tip a little smoky; anterior veins yellow; wing margins delicately ciliate; venation as with the male; halteres white. Length 3 to 5 mm.

Larva. The eggs I did not find. The larva is 8 to 10mm in length when full grown, pale or yellowish green in color, its head dark brown and heavily chitinized. The head is somewhat longer than wide, the dorsal suture well marked, and with a few setae arranged as in figure 4. Two setae are placed immediately in front of the transverse suture, and at the apical end of the labrum are two more [fig.4]. A ventral view of the labrum is given in figure 3; *c* representing the epipharynx to which perhaps belongs also the two lateral pieces with their pointed processes. The anterior margin is furnished with a number of small fleshy lobes. The antennae are small, the basal joints about four times as long as wide, with two terminal pieces, one of which is four jointed, the other simple [fig.1]. The mandibles [fig.2] are about twice as long as broad, heavily chitinized, and with five short, blunt terminal teeth; articulated at the base of each is a long slender piece, with four terminal spines. This is shown folded down in the figure. The maxillae are short protuberances, covered with pointed processes; a very short palpus with terminal papillae, and two stout setae projecting ventrad. The hypopharynx [fig.5] is tonguelike, with two long basal pieces. Its apex and its dorsal surface are covered with pointed papillae; ventrally, there is an open arched rib. At the cephalic end of the ventral sclerite and coalescent with it, is the labium, with 11 blunt marginal teeth, the middle one wide and broadly truncated. On the prothoracic segment are the two prolegs, each with about 30 long, curved spines, and a number of small and very short spines on the ventral surface. At the base is a single slender seta, on each side a little dorsad of the lateral line are two more, and caudad of these and below the lateral line a group of three. The 11th segment is without blood gills; the 12th with two comparatively short legs, each with a crown of eight to 10 bifid claws [fig.9, 12]; dorsad of which are two tufts of five or six bristles each. Between the prolegs and projecting caudad are four short blood gills.

Pupa. The pupa is about $4\frac{1}{2}$ mm long, with the colors of the adult. It is much shorter in comparison to its breadth than that of *Chironomus* (*sens. str.*). The wings extend to little beyond

the posterior margin of the second abdominal segment. Eight segments are present besides the short anal segment. On the dorsum of each segment, toward the caudal margin, is a transverse band of stout, black bristles. Each band is composed of five or six rows. The arrangement of these bristles (the longest of which are about one third as long as an abdominal segment) is shown in figure 11. The anal segment is composed of two lobes with a single apical bristle. After two to four days of pupal life, it transforms into the adult.

Genus *DIAMESA* Meigen

This genus has long been known to occur in Greenland, but has not, till now, been recorded from the United States. In 1898, Lundbeck described three new species from Greenland, one of which, *D. aberrata*, he considers the species which Staeger erroneously (?) identified as *D. waltlii*.

Antennae of the female eight jointed, the basal disklike, the intermediate ones rounded, the last cylindrical. Antennae of the males usually plumose and 14 jointed. Eyes oval; the front wide and flat. The eyes and the wings resemble *Tanypus*. The cell M is separated from the cell M_{1+2+3} by a cross vein, as in *Tanypus*. The fourth tarsal joint is shorter than the fifth.

Diamesa Waltlii Meigen

1838 *D. waltlii* Meigen, Syst. Besch. 7:13, 1

1846 *nivoriundus* Fitch (Chironomus), Winter Insects of Eastern New York nec *Orthocladus nivoriundus* Johnson, (?) Cat. of New Jersey Diptera

This fly occurs, sometimes abundantly, in this State from January to April. Fitch's description is rather indeterminate, but I believe it to belong to the species which is described below. I have compared it with specimens from Europe, with which it agrees in all particulars. According to Lundbeck [*Diptera Groelandica*, 1898], *D. Waltlii* does not possess cilia on the posterior margin of the wing, he quoting Meigen as authority; the European specimens which I have do have these cilia, as do also the American specimens; and I therefore believe that *aberrata* Lundbeck is also a synonym.

Male. Black. Head black, including eyes, mouth parts and antennae, the latter densely covered with long, dark brown hair. Its first joint enlarged, disklike, the second twice as long as broad, the following 11 a little shorter than broad, the 14th

longer than all the rest taken together. The palpi are somewhat shorter than the antennae, four jointed (besides a small basal piece), the first joint shorter, the fourth longer than the other two. Dorsum of the thorax black, subshining, with a faint cinereous bloom, covering the surface excepting the three slightly raised longitudinal stripes, which are deep black, and on which are arranged some scattered black setae; scutellum dark brown, with black setae; metanotum and pleura black, the latter with a gray bloom; abdomen black, longer than the wings in fresh specimens, covered with fine brown or black hairs, posterior margins of the segments narrowly cinereous.

Genitalia conspicuous and rather complex [pl.47, fig.8 dorsal, fig.10 ventral, view]. The apical joint of the appendages, triangular in outline with a sharp point; the basal joint with a pointed process attached near its base on the inner side, mesad of which are two smaller pointed projections. The dorsal spur is nearly straight and spikelike. Legs uniformly fuscous, all the fourth tarsal joints shorter than the fifth, tarsal claws simple. Wings broad, and nearly as long as the abdomen in fresh specimens; usually longer than abdomen in dried specimens; cinereous in color, the anterior veins conspicuous, brownish or black; media and cubitus pale, posterior margin very delicately ciliate. Halteres usually pale, in some specimens pale brownish, the knob triangular in outline. Length 3.5 to 5mm.

Female. Cinereous black, front and epistome cinereous, eyes but slightly excavated at base of antennae; palpi and antennae fuscous, the latter with eight joints counting the disklike basal joint, short haired [fig.7]; scutellum hemispherical, dark brown, with black setae; abdomen fuscous with short brown hairs, posterior margin of the segments darker except on the extreme edge, which is pale yellow; genitalia small, brown and leaflike; legs fuscous; claws simple; wings broad, and longer than the abdomen; anterior veins black; media and cubitus pale; venation as in the figure. Length 3.5 to 5 mm. All else as with the male. Described from bred and captured specimens.

Larva [pl.48, fig.9-13]. The larvae were taken in company with the larvae of *Thalassomyia fusca* among the algae on the surface of rocks over which the water flows rapidly. In its pale green color, its general appearance, and even in many details it greatly resembles *Thalassomyia fusca*. The dorsal sclerite of the head is shaped like that of the last mentioned species shown on plate 50, figure 4; with two pair of marginal setae, but the hindmost pair are situated farther back than in *Thalassomyia fusca*. On the lateral sclerite there is one seta near the base of the

mandible just above the lateral line, one pair below this one and a little cephalad; another pair about one fourth of the length of the head caudad of these but lying as far below the lateral line as the first is above. Directly caudad of the first, but midway between the front and hind margin of the head, is another. Close to the dorsal suture, one fourth the length of the head cephalad of the caudal margin, is still another; and finally there is a single one on each side at the base of the labium [fig.10].

The ventral surface of the labrum is shown in figure 9. The hypopharynx resembles that shown in plate 50, figure 5; and the maxilla that shown in figure 6. The epipharynx is as shown on plate 48, figure 9c, its free end having four to six filaments, the apical pair being stoutest. This member may be bent forward and the filaments then spread out, fanlike. The "jointed appendages" [fig.9j] are well developed; each is apically expanded into a handlike process with seven or eight "fingers." These appendages are attached at a point near the anterior margin of the labrum. The mandibles [fig.12] have each five blunt teeth, a fringe of coarse branched hairs projecting mesad, and two stout setae on the dorsal surface near the base. The labium [fig.10] possesses about 19 blunt teeth, no suture being visible between it and the lateral (or ventral?) sclerite. The antennae are of moderate length [fig.11] and bare, with three terminal, jointed appendages. The thoracic and abdominal feet are as on plate 50, figures 7 and 12; but the abdominal legs appear a little longer in proportion to their diameter. The entire body of the larva is almost devoid of hairs excepting the caudal tuft.

Pupa [fig.13]. The pupa is of a fuscous color with a greenish tinge; its thorax is apparently without either tracheal gills or breathing tube. On the dorsal posterior margins of each of the abdominal segments excepting the first and last there are 10 to 12 short, stout, caudad projecting teeth, the two or three lying nearest the lateral margin being smaller than those more dorsad; and on the ventral posterior margin of the abdominal segments excepting the first, second and last there are six or eight stout teeth projecting cephalad. At the anal end of the last segment are three pairs of short hollow filaments, which may have a respiratory function. The length of pupal life is about two days.

This pupa greatly resembles that of *Diamesa culicoides* as figured by Heeger in Sitzb. d. k. Akad. d. Wiss. Wien., 1853, excepting that in the latter there are eight caudal filaments instead of six.

Described from specimens taken in Cascadilla creek, Ithaca N. Y., April 1902.

EXPLANATION OF PLATES

PLATE 32

Simulium territory

A little fall in the bottom of Cascadilla gorge.

PLATE 33

Simulium meridionale

- 1 Mandible of larva. x110
- 2 Maxilla of larva. x110
- 3 Hypopharynx of larva. x110
- 4 Labium of larva. x190
- 5 Respiratory filaments of pupa. x40

Simulium pecuarum

- 6 Mandible of larva. x110
- 7 Hypopharynx of larva. x110
- 8 Labium of larva. x190
- 9 Maxilla of larva. x110
- 10 Respiratory filaments of pupa. No scale
- 11 Labrum of larva. x110

PLATE 34

Simulium hirtipes

- 1 Wing of male. x15. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media.
Cu Cubitus. *A* Anal
- 2 Palpus of adult. Female. x40
- 3 Maxilla of larva. x110
- 4 Labium of larva. x110
- 5 Antenna of larva. x110
- 6 Mandible of larva. x110
- 7 Ventral view of head of larva. No scale. *lr* Labrum. *m* Mandible.
x Maxilla. *l* Labium. *f* Fan
- 8 One ray of fan of larva. No scale
- 9 Larva. x6
- 10 Pupa. x6
- 11 Ventral view of caudal disk. x6
- 12 One of the radial rows of hooks of caudal disk. No scale
- 13 Pupal respiratory filaments. No scale

PLATE 35

Simulium vittatum

- 1 Respiratory filaments of pupa. x40
- 2 Labium of larva. x190
- 3 Mandible of larva. x110

Simulium sp.

From California, Santa Cruz mountains

- 4 Respiratory filaments of pupa. No scale
- 5 Pupal case. No scale
- 6 Mandible of larva. x110
- 7 Labium of larva. x190

From Leland Stanford jr University campus

8 Labium of larva. x190

From Las Vegas N. M.

9 Antenna. x190

10 Labium. x110

PLATE 36

Simulium pictipes

1 Mandible of larva. x110

2 Maxilla of larva. x110

3 Labium of larva. x110

4 Hypopharynx of larva. x110

5 Labrum of larva. x110

6 Cross section of hypopharynx. x110

7 Wing of male. x15

8 Thoracic respiratory filaments of pupa. x15

PLATE 37

Simulium venustum and varieties

1 Maxilla of larva. x110

2 Hypopharynx of larva, var. *piscicidium*. x110

3 Labrum of larva, *venustum*. x110

4 Respiratory filaments of pupa. x40

5 Labium of larva, var. *piscicidium*. x190

6 Labium of larva, *venustum*. x190

7 Respiratory filaments of pupa, var. *piscicidium*. x110

8 Wing of imago, var. a

9 Caudal appendages (blood gills) of larva, var. a. x110

10 Hypopharynx of larva, var. a. x110

11 Thoracic respiratory filaments of pupa, var. a. x110

12 Labrum of larva, var. a. x110

13 Mandible of larva, var. a. x110

14 Labium of larva, var. a. x190

PLATE 38

Legs. x50; claws. x190

1 *S. venustum* (var. *piscicidium*). Hind tarsus of male

2 *S. venustum* (var. *piscicidium*). Middle tarsus of male

3 *S. venustum* (var. *piscicidium*). Fore tarsus of male

4 *S. venustum* (var. a) Fore tarsus of female

5 *S. venustum* (var. a) Middle tarsus of female

6 *S. venustum* (var. a) Hind metatarsus of male

7 *S. peculiarum*. Hind metatarsus of female

8 *S. pictipes*. Hind metatarsus of male

9 *S. vittatum*. Hind metatarsus of female

10 *S. hirtipes*. Hind metatarsus of female

11 *S. hirtipes*. Hind metatarsus of male

12 *S. meridionale*. Male and female metatarsus

13 *S. bracteatum*. Female metatarsus

14 *S. peculiarum*. Claw of female

15 *S. bracteatum*. Claw of female

16 *S. meridionale*. Claw of female

- 17 *S. pictipes*. Male
- 18 *S. meridionale*. Male
- 19 *S. venustum*, var. *piscicidium*. Female
- 20 *S. pictipes*. Female
- 21 *S. ochraceum*. Hind metatarsus of female

PLATE 39

Corethra plumicornis

- 1 Larva of *C. plumicornis*. x12
- 2 Pupa of same. x12
- 2*a* Breathing tube of pupa. x110
- 3 Ventral view of head. x40. *c* Labium. *x* Maxillae
- 4 Lateral view of head, larva. *a* Antennae. *b* Filaments of third metamere of Meinert. *c* Leaflike appendages. *l* Labrum. *f* Fans.
m Mandibles. *x* Maxilla
- 5 Swimming paddles of pupa. x15
- 6 Anal segment of larva. x40
- 7 Head of female. x15
- 8 Genitalia of male. x40
- 9 Wing of female. x15. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media.
Cu Cubitus. *A* Anal
- 10 Wing of male. x15
- 11 Wing of *C. albipes* n. sp. x15

PLATE 40

Corethrella brakeleyi Coquillett

- 1 Full grown larva, dorsal view. x25. *a* Antenna. *b* Lateral sclerite of the head showing the spines. *d* Dorsal sclerite of the head
- 2 Ventral view of larval head. x25. *lr* Labrum. *md* Mandible. *b* Lateral sclerite of the head. *l* Labium
- 3 Antenna of larva. x110
- 4 Labrum of larva. x110
- 5 Larval mouth parts, ventral view. x110. *md* Mandibles. *mx* Maxilla:
i Ventral lobe of the maxilla (perhaps cephalic prolongation of the head sclerite; *l* Labium
- 6 Dorsal view of left mandible of larva. x110
- 7 Fifth tarsal joint and claws of hind foot of adult male. x190
- 8 Antenna of adult male. x37½
- 9 Wing, denuded of hair. Female. x48
- 10 Last four abdominal segments of pupa. x37½

Culex sylvestris

- 11 Long claws of middle foot of male. x190
- 12 One of the claspers of the male. x48

PLATE 41

Pelorempis n. gen.

- 1 Larva, ventral view. Thorax and abdomen diagrammatic. x7
- 2 Head of same, dorsal view. x7
- 3 Mouth parts, ventral view. x40. *l* Labium. *x* Maxillae. *m* Mandible
- 4 Dorsal aspect of breathing apparatus on the eighth segment. x20.
s Spiracle
- 5 Dorsal aspect of left mandible. x40

- 6 Dorsal aspect of labrum
- 7 Swimming paddles of the pupa. x7
- 8 Pupa. x7
- 9 A scale from upper surface of the labrum
- 10 Head of female
- 11 Lateral aspect of head. Female
- 12 Fore tarsal claw of female
- 13 Fore tarsus of female
- 14 Wing of female. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media. *Cu* Cubitus

PLATE 42

Anopheles punctipennis

- 1 Breathing apparatus on eighth segment, dorsal aspect. *s* Spiracle
- 2 Dorsal aspect of thorax and first abdominal segment. x15
- 3 Ventral aspect of head. x40. *l* Labium. *x* Maxillae. *p* Palpus.
m Mandible
- 4 Lateral aspect of ninth abdominal segment
- 4a Palmate hairs on sides of the third to seventh abdominal segments
- 5 Wing of female
- 6 Dorsal aspect of the larval head. x40
- 7 Mandible of the larva. x110
- 8 Wing of *Psorophora ciliata*. Male
- 9 Wing of *A. maculipennis* female. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media. *Cu* Cubitus
- 10 Genitalia of male. x110
- 11 Breathing trumpet of pupa. x50

PLATE 43

Culex pipiens L.

- 1 Anal end of larva. x15
- 2 Head of larva. x15
- 3 Antenna of larva. x50
- 4 Dissection of ventral part of head, showing mouth parts. x50
m Mandible. *x* Maxilla. *l* Labium. *h* Hypopharynx
- 5 Ventral aspect of the upper lip. *lr* Labrum. *f* Fans. *e* Epipharynx.
x50
- 6 Swimming paddles of pupa. x40
- 7 Pupa. x12
- 8 Fore tarsal claw of male. x110
- 9 Fore tarsal claw of female. x110
- 10 Wing of male. x15
- 11 Male genitalia. x50
- 12 Wing of female. x15. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media.
Cu Cubitus

PLATE 44

Culex restuans

- 1 Labium of larva. x190
- 2 Mandible. x110. *s* Serrate spine
- 3 Dorsal aspect of head and thorax. x15
- 4 Antenna. x110

- 5 Dorsal aspect of hypopharynx. x400
- 6 Ventral aspect of epipharynx. x110
- 7 Caudal end of larva. x15
- 8 Dorsal aspect of labrum. c Clypeus
- 9 Wing of male
- 10 Wing of female
- 11 Breathing trumpet of pupa. x50
- 12 Palpus of adult male. x15
- 13 Palpus of adult female. x50

PLATE 45**Culex cantans** Meigen

- 1 Ventral aspect of mandible. x110. Larva
- 2 Dorsal aspect of mandible. x110
- 3 Maxilla with palpus. Larva
- 4 Antenna of larva. x110
- 5 Serrate spine of the breathing tube, of larva
- 6 Caudal end of larva. x15
- 7 Dorsal aspect of thorax. Larva
- 8 Third, fourth and fifth fore tarsal joints of the male. x50
- 9 Wing of the male. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media. *Cu* Cubitus. *A* Anal vein
- 10 Long claw on middle foot of male

PLATE 46**Culex triseriatus** Say

- 1 Antenna of the larva
- 2 Mandible, dorsal aspect. x110
- 3 Dorsal aspect of the head and thorax of larva. x15
- 4 Labium of larva. x190
- 5 Caudal end of larva, lateral aspect. x15
- 6 Hypopharynx of larva, conventionalized
- 7 Wing of female. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media. *Cu* Cubitus

Uranotaenia sapphirina O. S.

- 8 Dorsal aspect of larva. After Dyar
- 9 Caudal end of larva. After Dyar
- 10 Antenna of larva. After Dyar
- 11 Pupa. After Dyar
- 12 Male genitalia, lateral aspect. x110
- 13 Wing of female
- 14 Wing of male
- 15 Fourth and fifth tarsal joint of middle leg of the male

PLATE 47**Aedes smithii** Coquillett

- 1 Antenna of larva. x110
- 2 Dissection of ventral part of the larval head, showing the mouth parts. x110. *m* Mandibles. *x* Maxillae. *l* Labium
- 3 Dorsal aspect of the larva. x18
- 4 Breathing trumpet of the pupa. x50
- 5 Swimming paddles of pupa. x15
- 6 Caudal end of the larva. x15

Diamesa waltlii Meigen

- 7 Antennae of the female. x50
- 8 Dorsal aspect of the male genitalia. x50
- 9 Wing of the female. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media.
Cu Cubitus
- 10 Male genitalia, ventral aspect. x50
- 11 Fore foot of the female

PLATE 48**Dixa modesta** n. sp.

- 1 Ventral surface of larval head. x50. *l* Labrum. *a* Antenna. *mx* Maxilla with its palpus
- 2 Mandible of the larva. x190
- 3 Maxilla and its palpus, *p*. x115
- 4 Pupa. x15
- 5 Larva, ventral view. x15. *a* Ventral caudal lobe. *b* Ventral foot bristles. *c* Abdominal prolegs
- 6 Dorsal view of the dorsal head sclerite. x60
- 7 Dorsal view of the caudal appendages of the larva. x40. *p* "Triangular chitinized plate." *s* Spiracles
- 8 Wing of the imago. x15. *Sc* Subcosta. *R* Radius. *M* Media. *Cu* Cubitus. *A* Anal

Diamesa waltlii Meigen

- 9 Ventral view of the labrum of the larva. x190. *j* Jointed appendages. *e* Epipharynx
- 10 Ventral view of the labium of the larva. x190
- 11 Larval antenna. x190
- 12 Larval mandible. x190
- 13 Pupa. x12

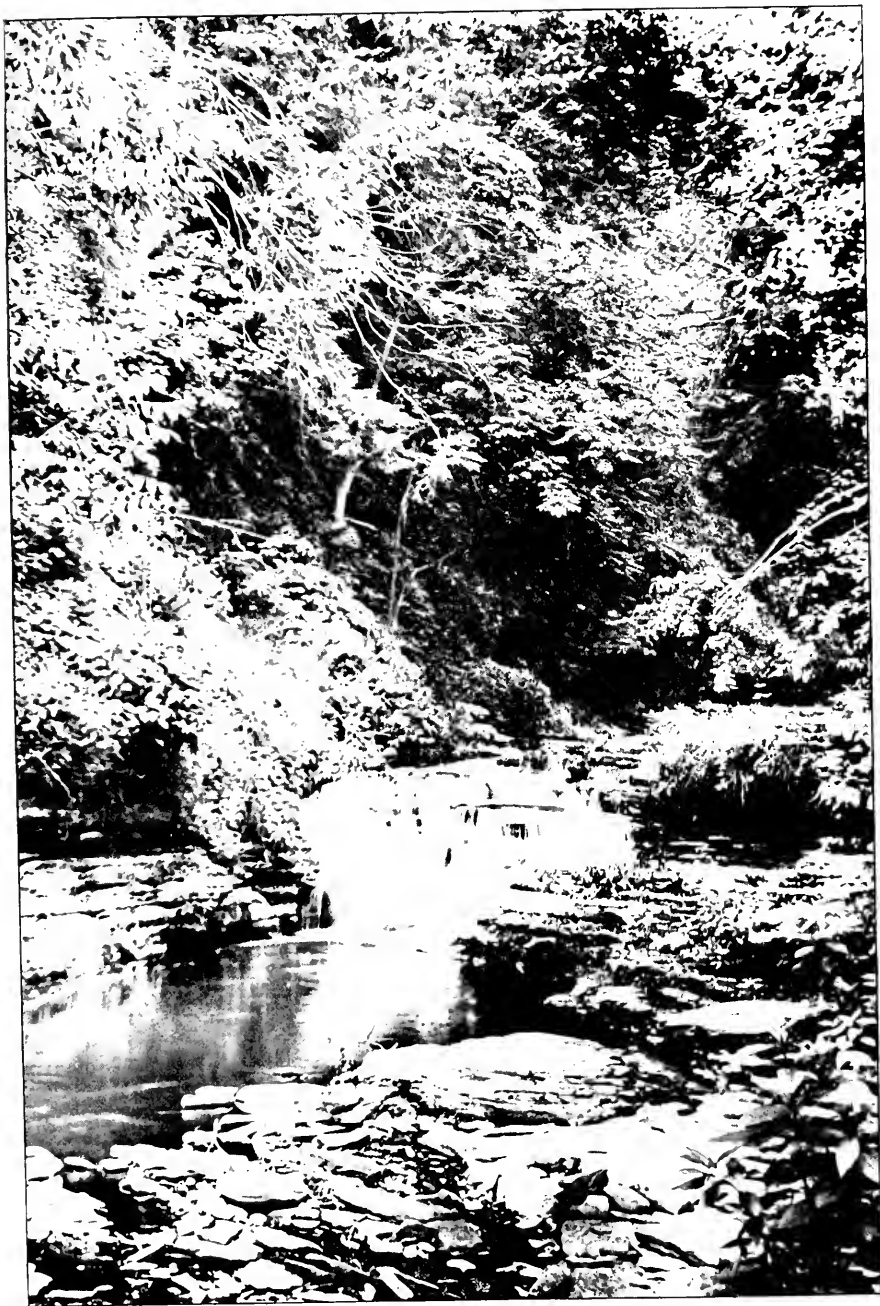
PLATE 49**Chironomus** sp.

- 1 Hypopharynx of the larva. x110
- 2 Antenna of the larva. x190
- 3 Ventral aspect of the upper lip, showing the epipharynx. x110
- 4 Head and thorax of larva, showing the thoracic proleg. x15
- 5 Ventral aspect of the head. *mn* Mandible. *mx* Maxillae. *l* Labium. x50
- 6 Mandible. x110
- 7 Caudal end of larva, with its anal prolegs. x15
- 8 Frontal aspect of the larval head. x50. *lr* Labrum. *m* Mandible. *a* Antenna. *l* Labium
- 9 Dorsal aspect of the larval maxilla. x190
- 10 Ventral aspect of seventh, eighth and ninth abdominal segments of pupa
- 11 Genitalia of the male. x50
- 12 Pupa

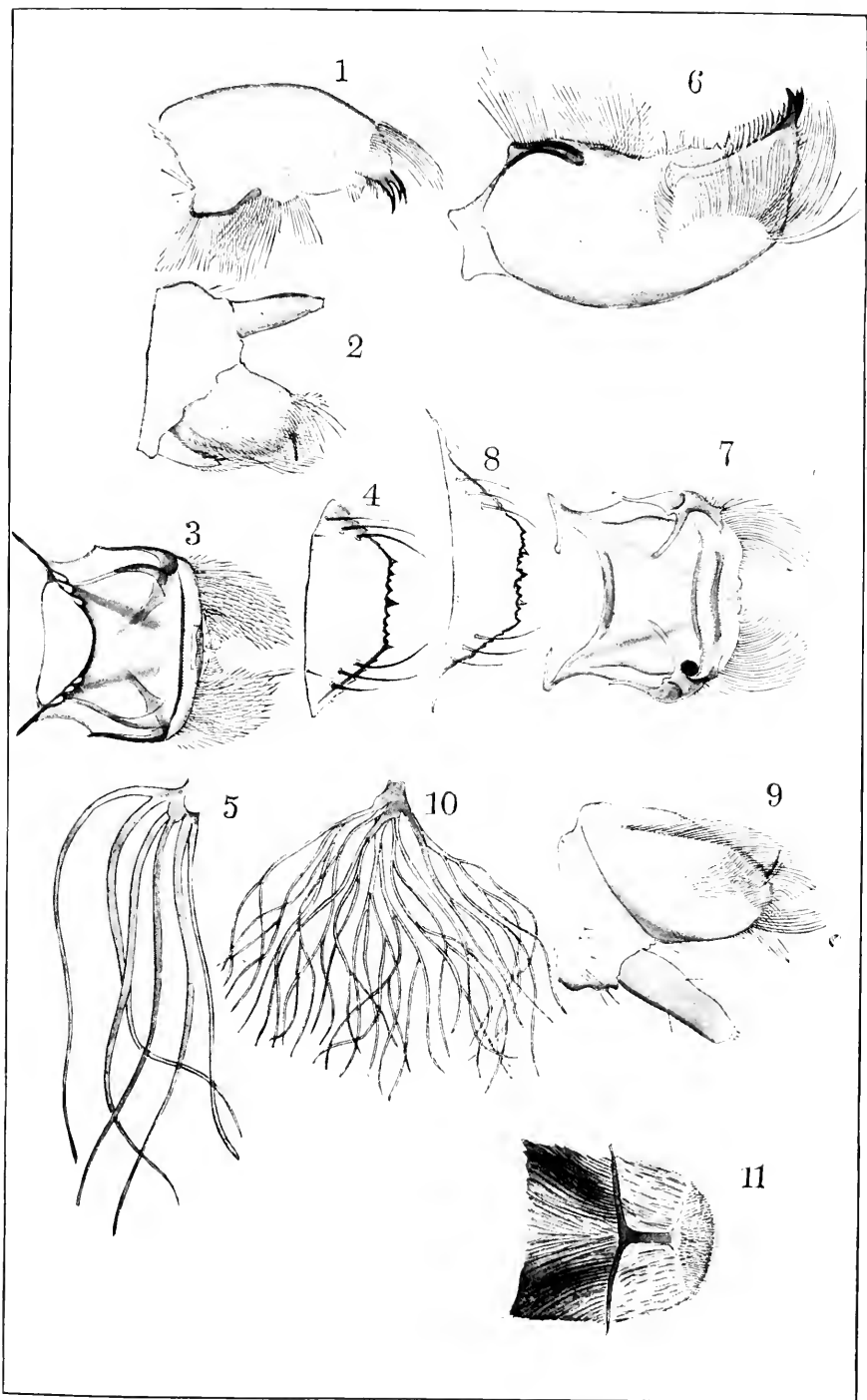
PLATE 50**Thalassomyia obscura** n. sp.

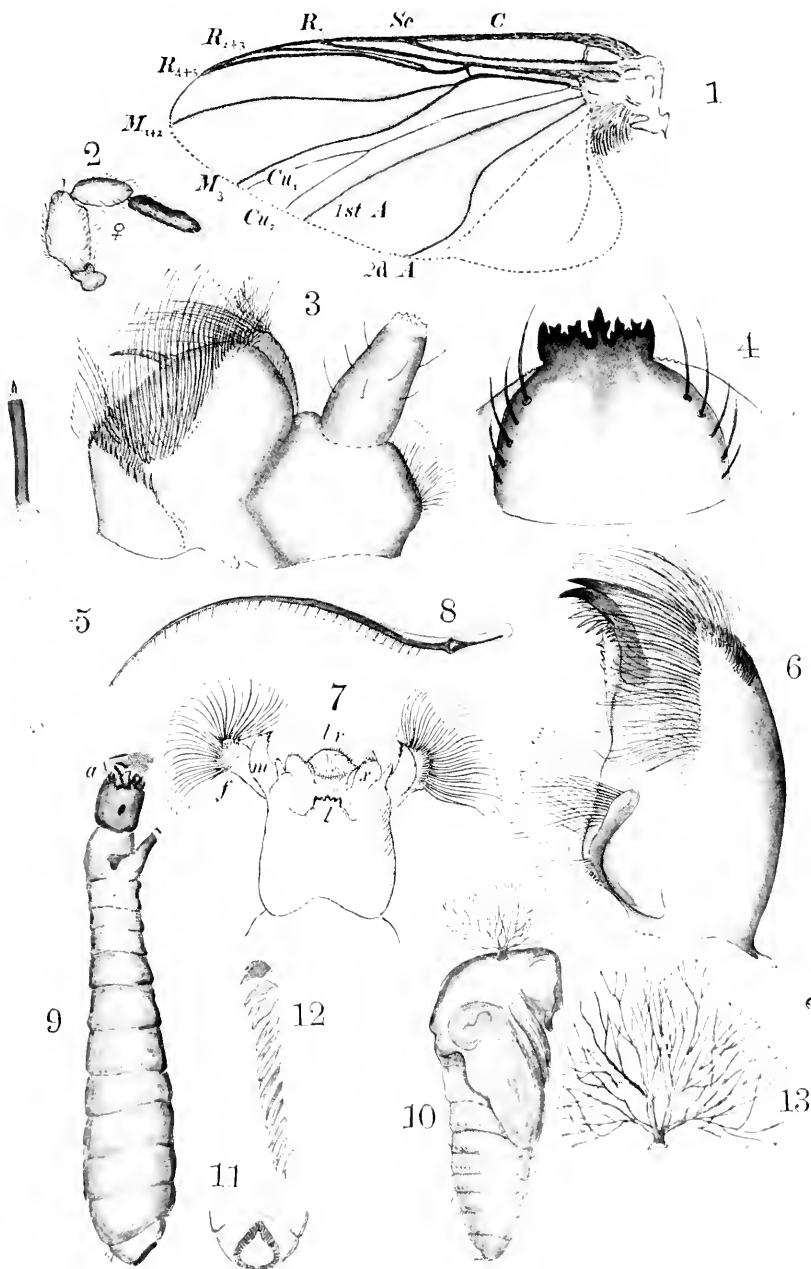
- 1 Antenna of the larva. x190
- 2 Ventral aspect of the larval mandible. x190
- 3 Ventral aspect of the upper lip (labrum). x190. *e* Epipharynx

- 4 Dorsal aspect of the head. x50
- 5 Dorsal aspect of the larval hypopharynx. x190
- 6 Ventral aspect of the larval maxilla. x190
- 7 Armature of the thoracic prolegs. x400
- 8 Labium of the larva. x190
- 9 A claw from the anal prolegs of the larva. x400
- 10 Pupa
- 11 Armature of the abdominal segments of the pupa
- 12 Anal end of the larva with its prolegs. x50
- 13 Dorsal aspect of the male genitalia. x50
- 14 Foot of middle leg of female
- 15 Wing of male. *C* Costa. *Sc* Subcosta. *R* Radius. *M* Media. *Cu*
Cubitus

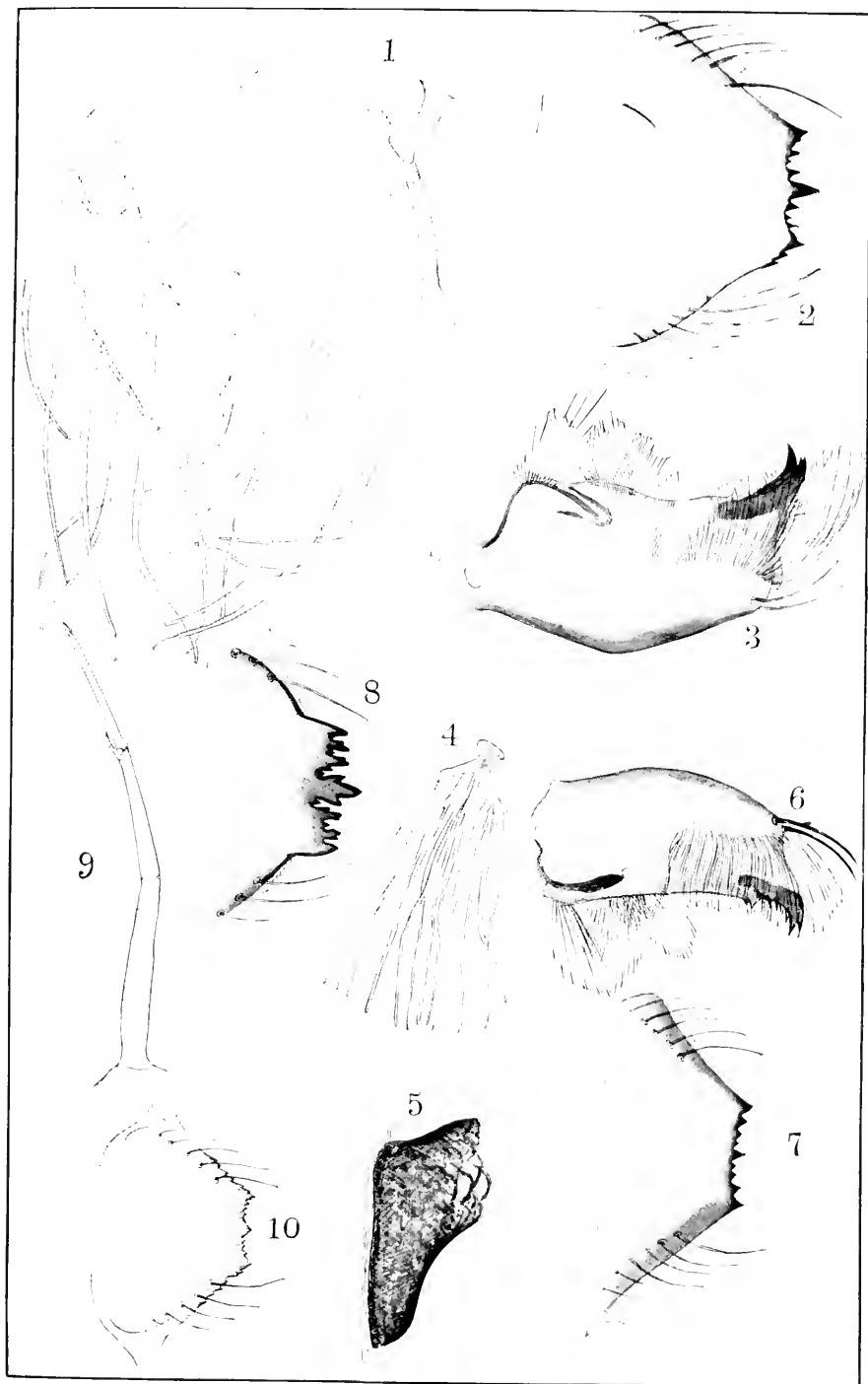


Cascadilla creek

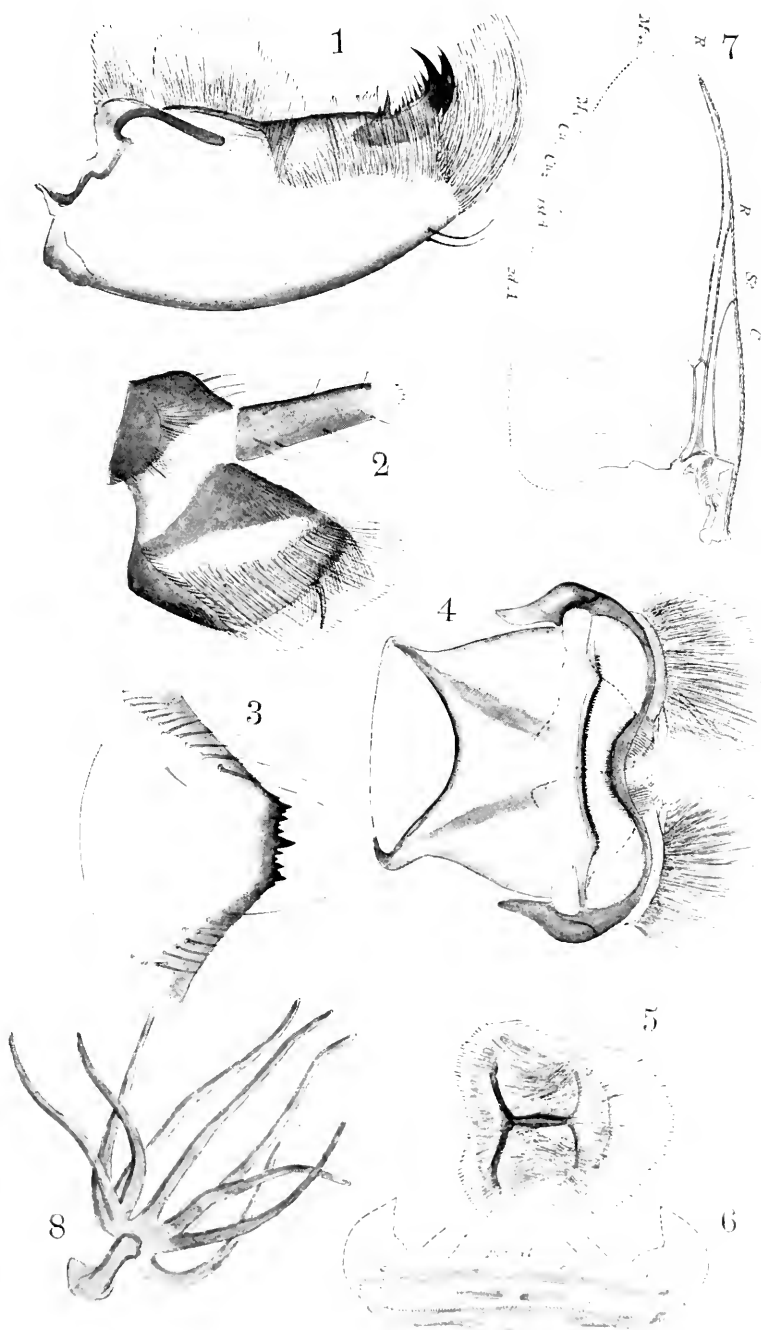




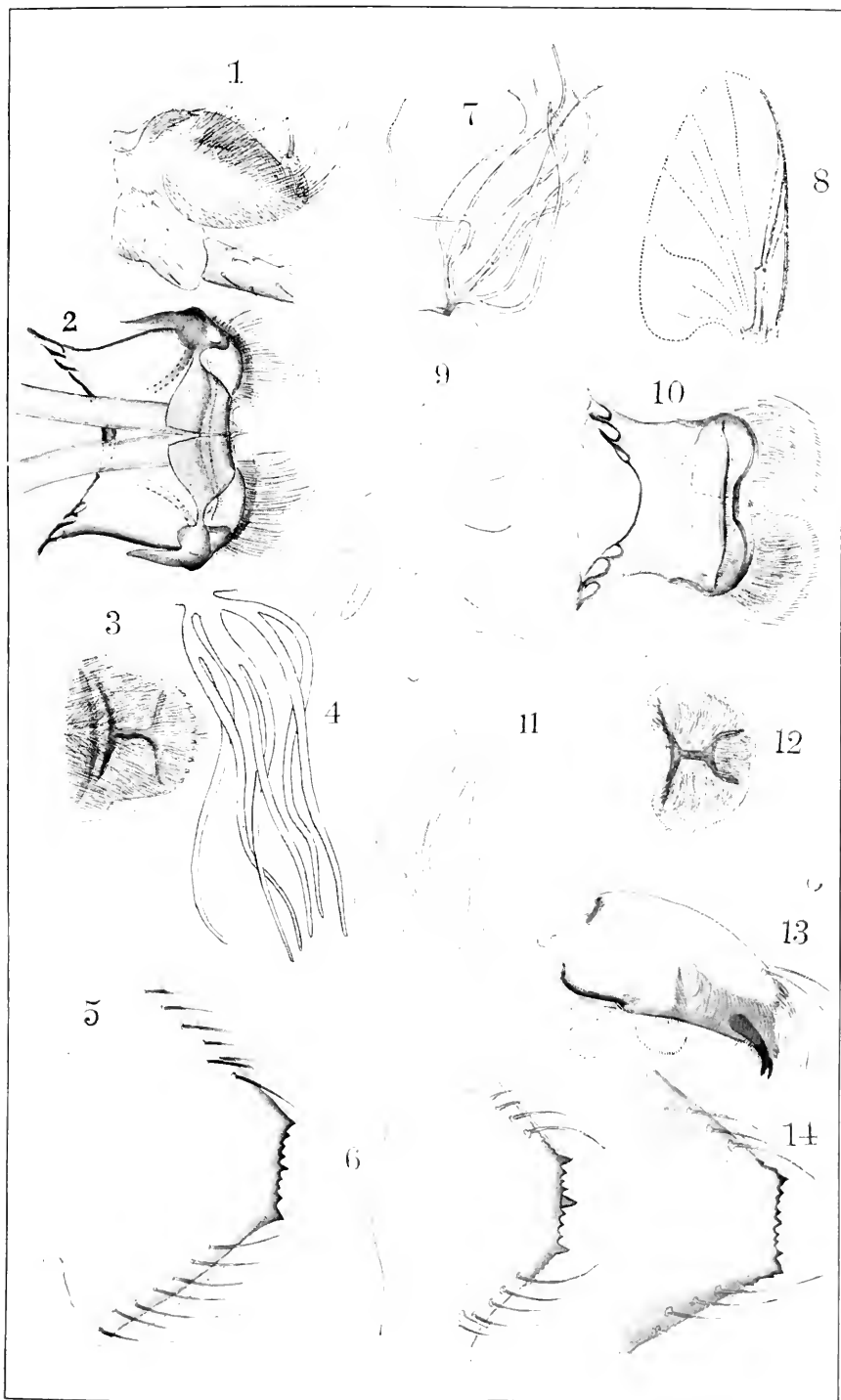
Simulium hirtipes



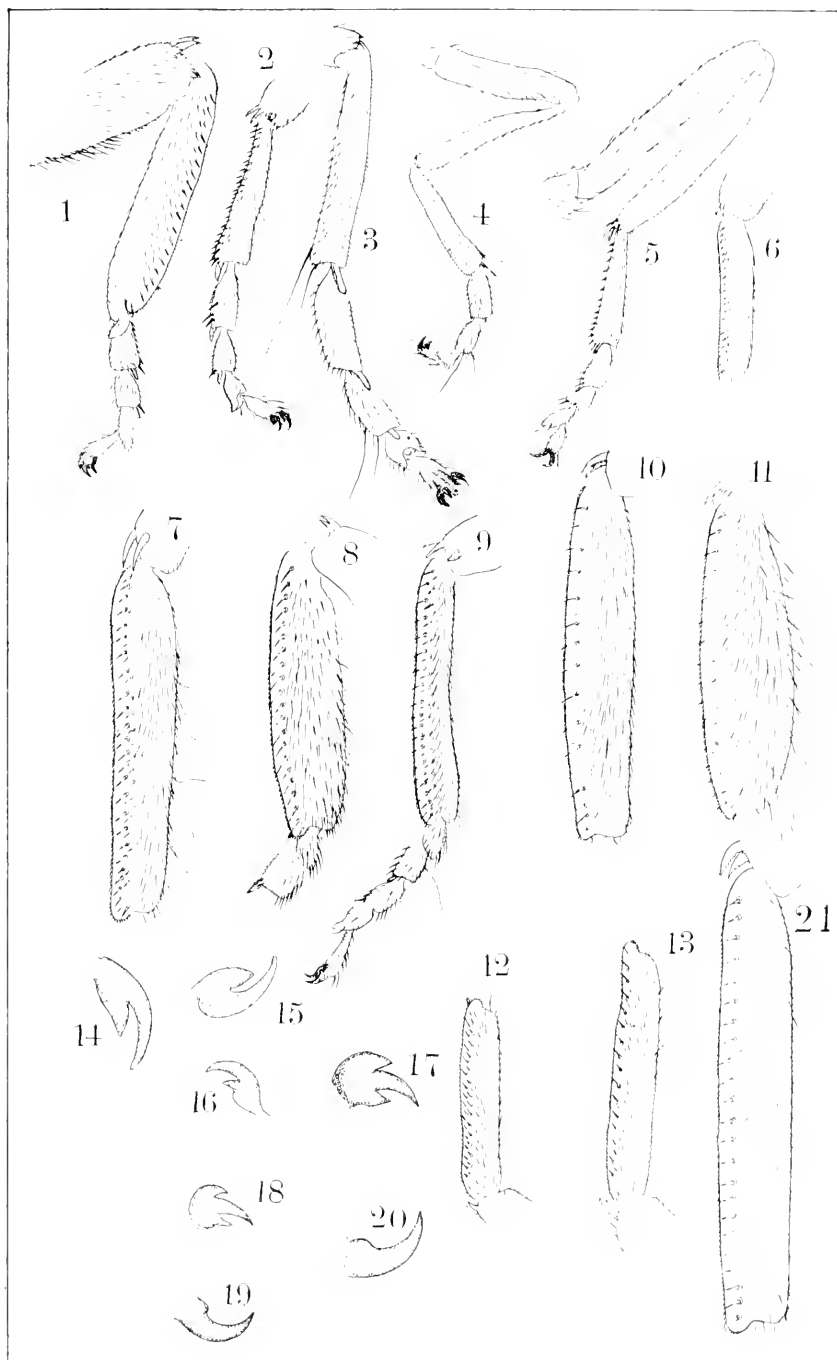
Details of *Simulium* larvae and pupae (*S. vittatum* and others)



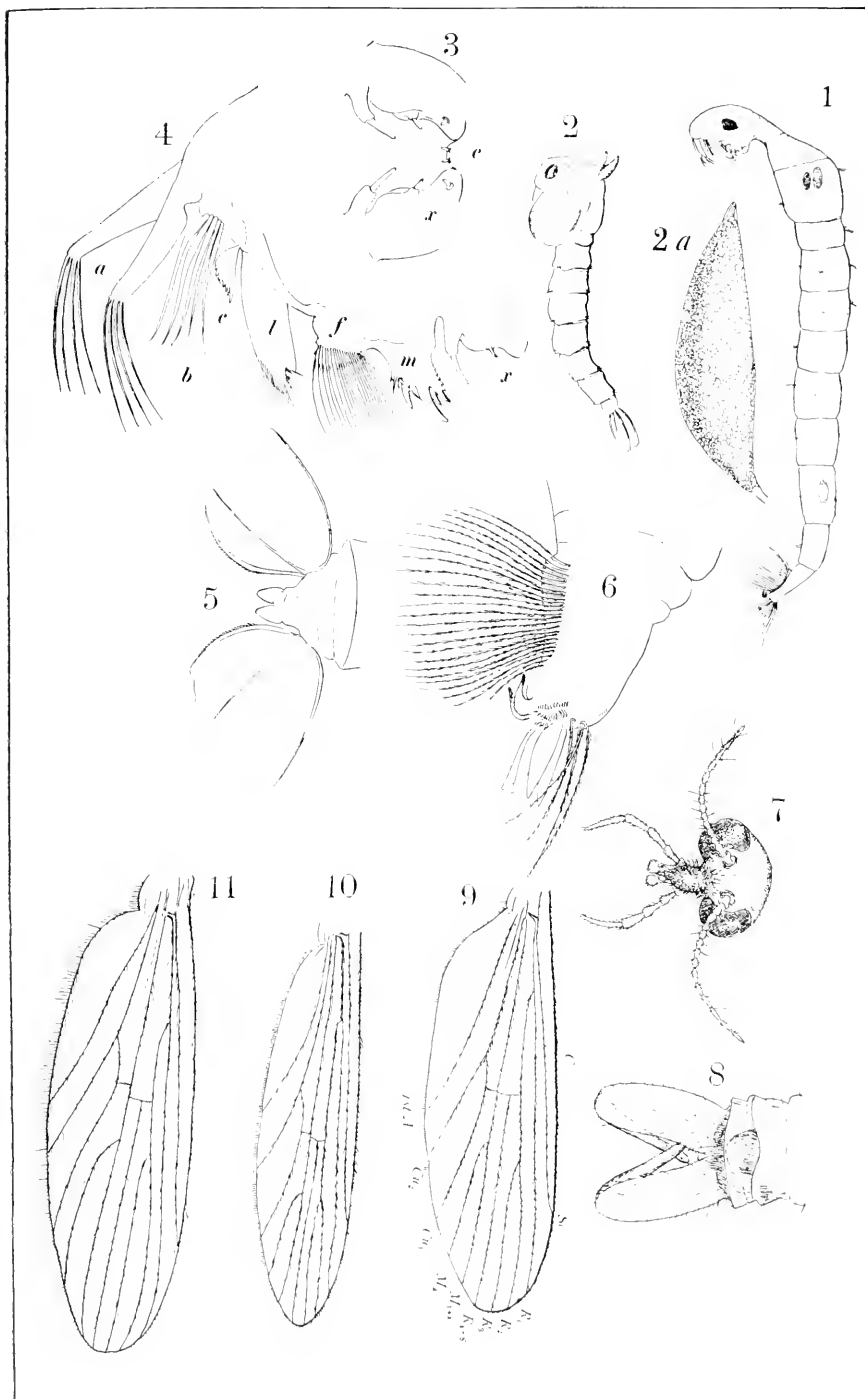




Simulium venustum

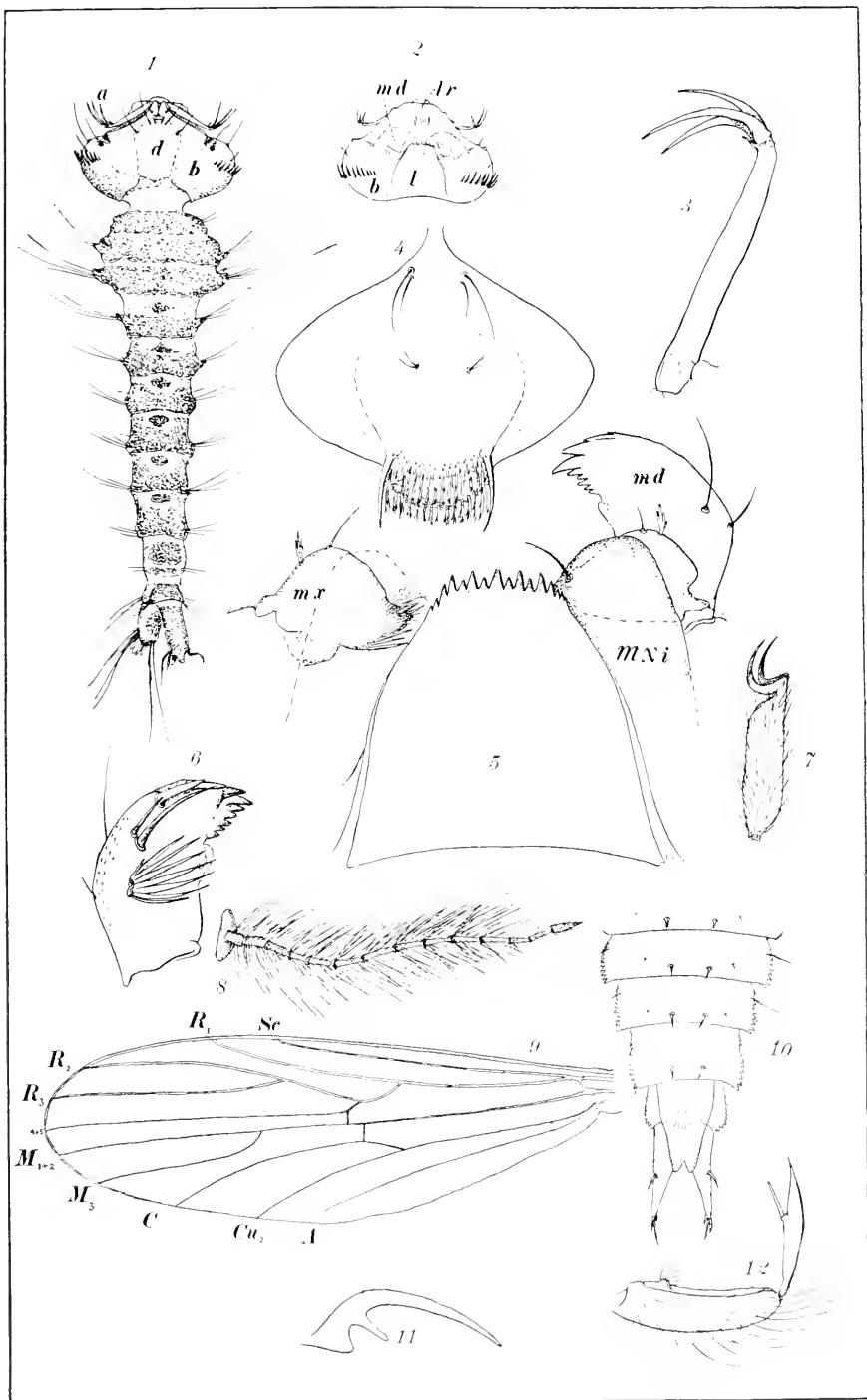


Legs and Claws of *Simulium* sp.

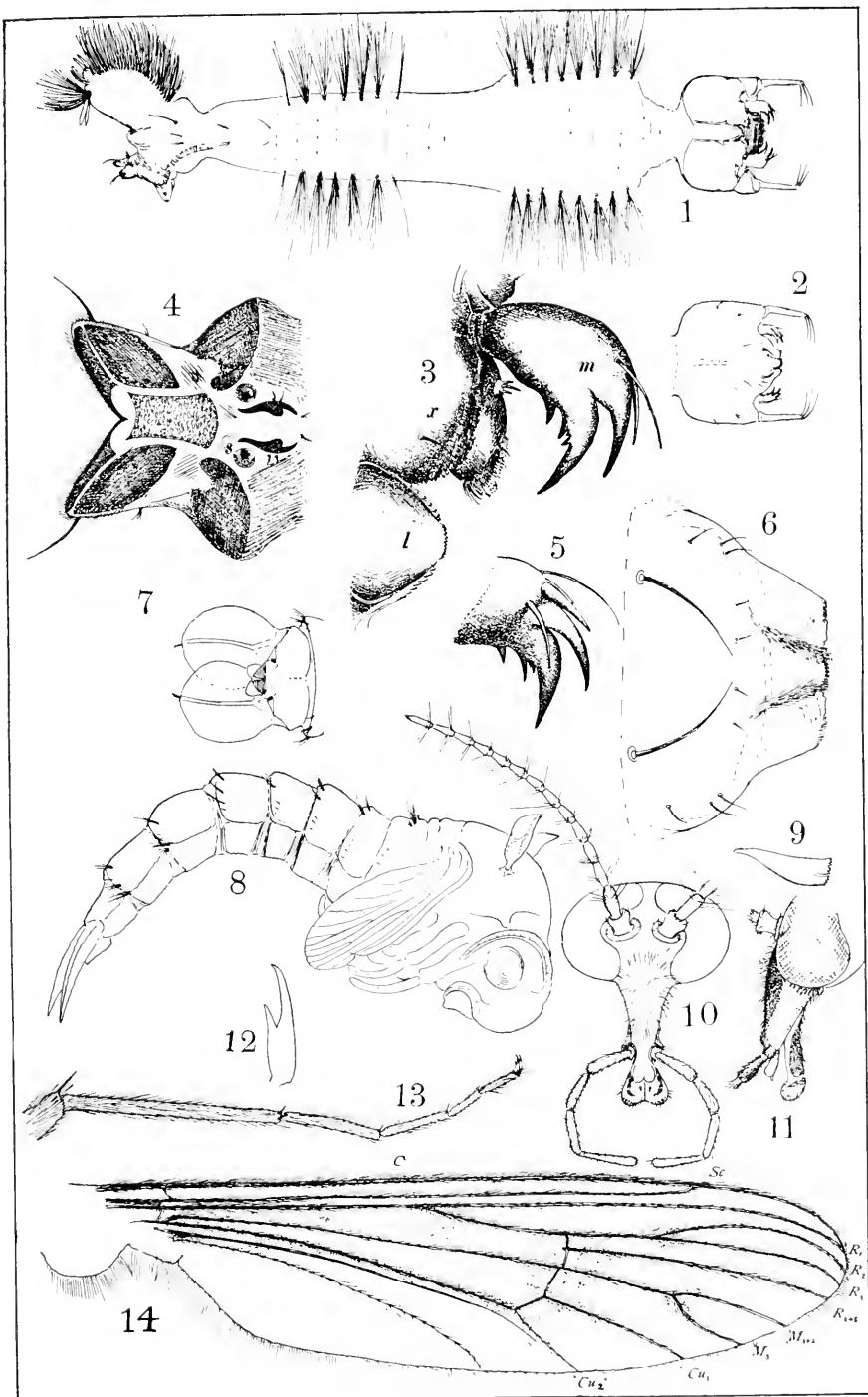


Corethra

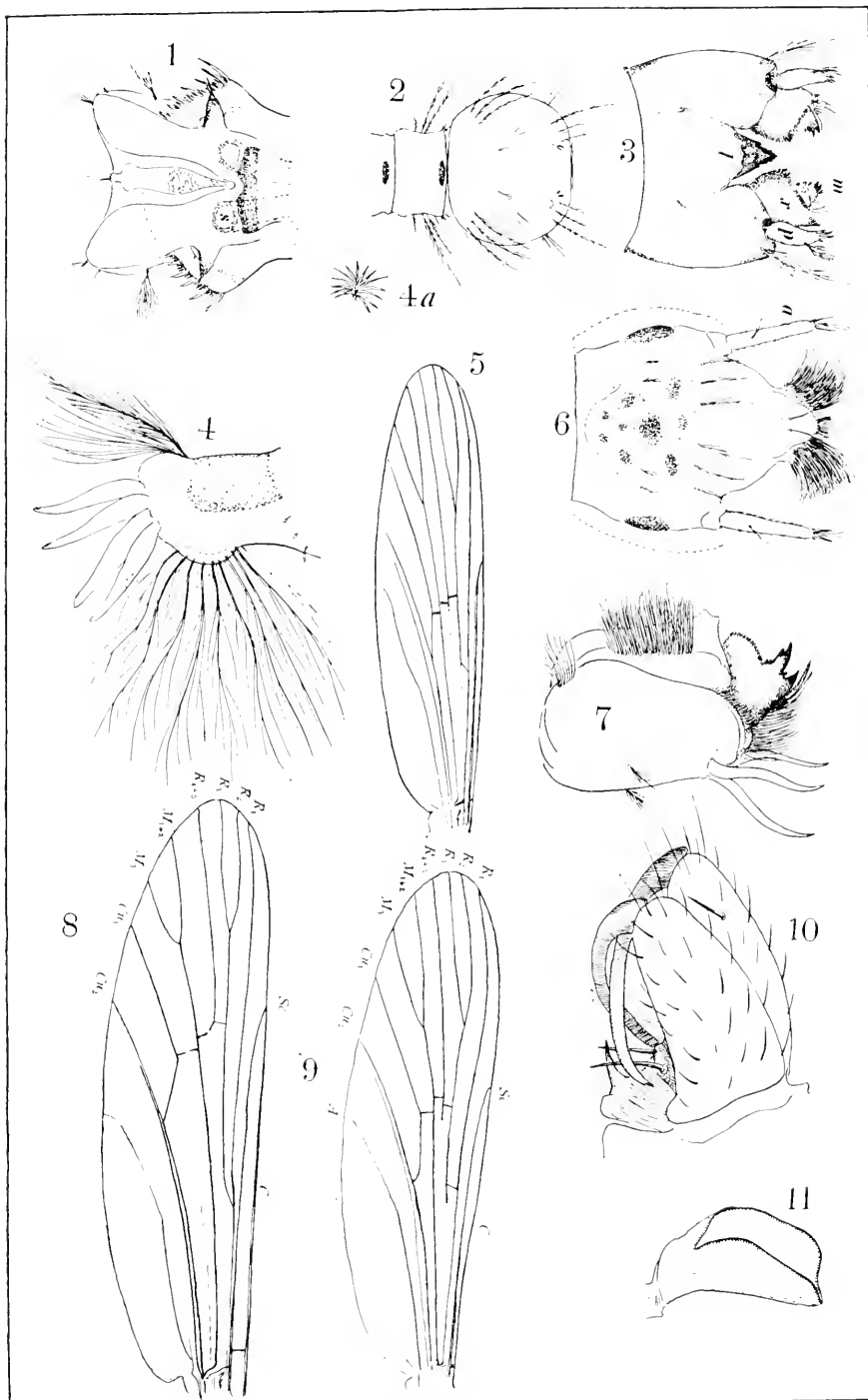


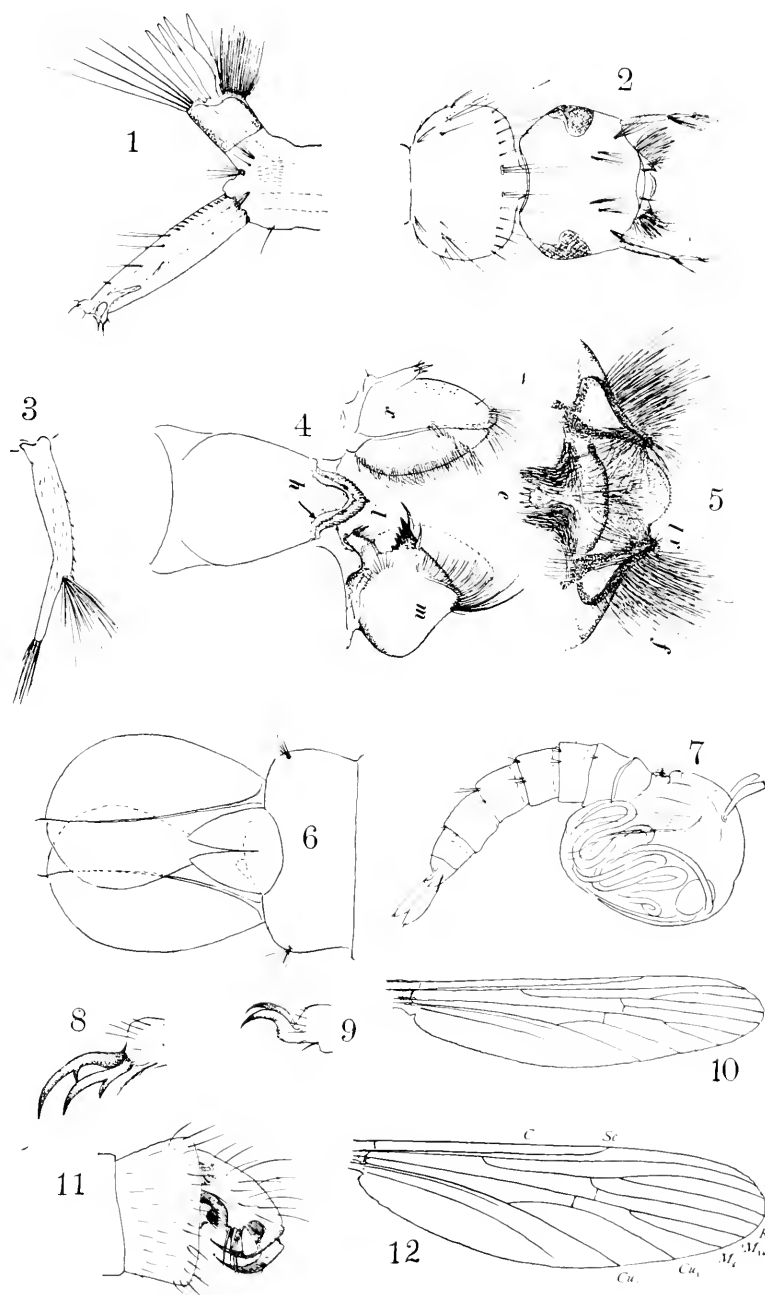


Corethrella brakeleyi

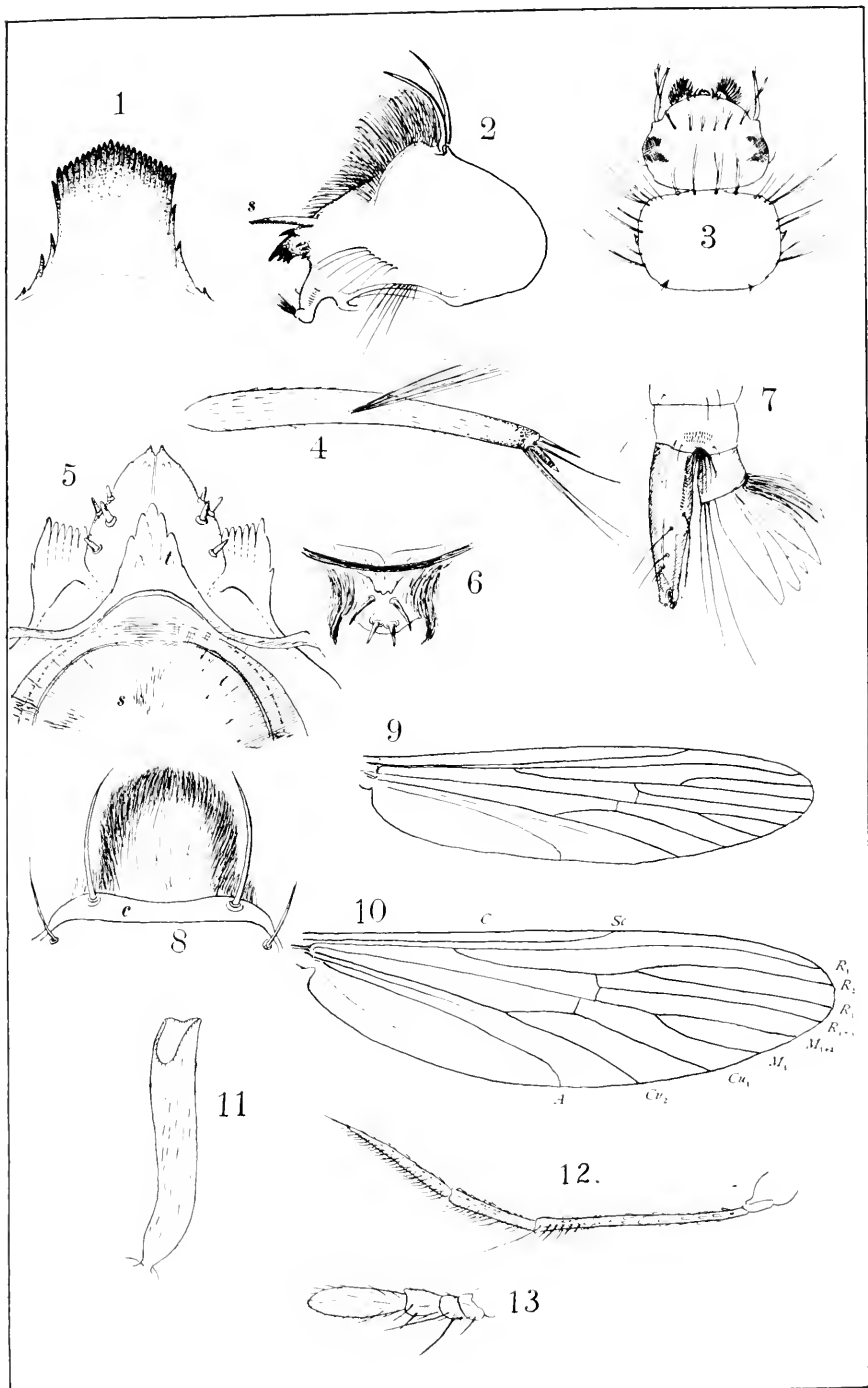


Pelorempis americana

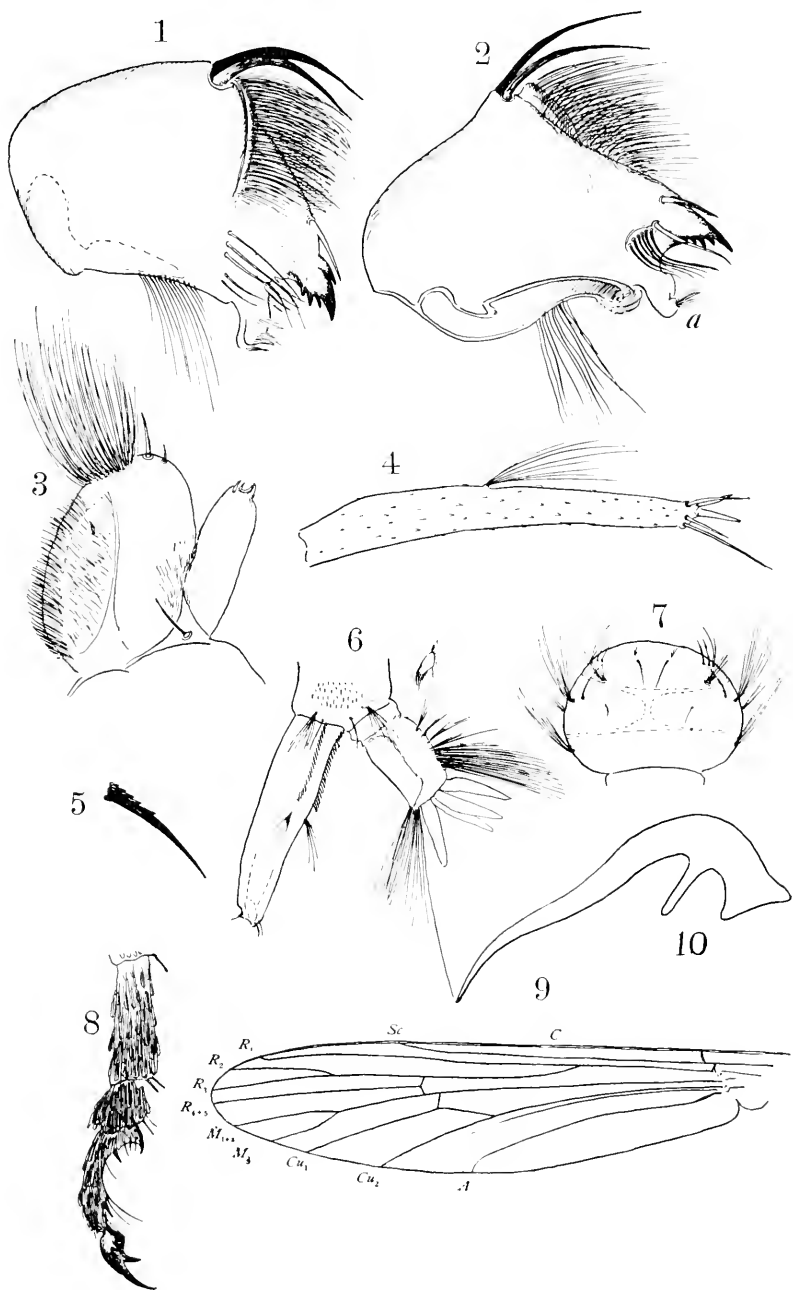




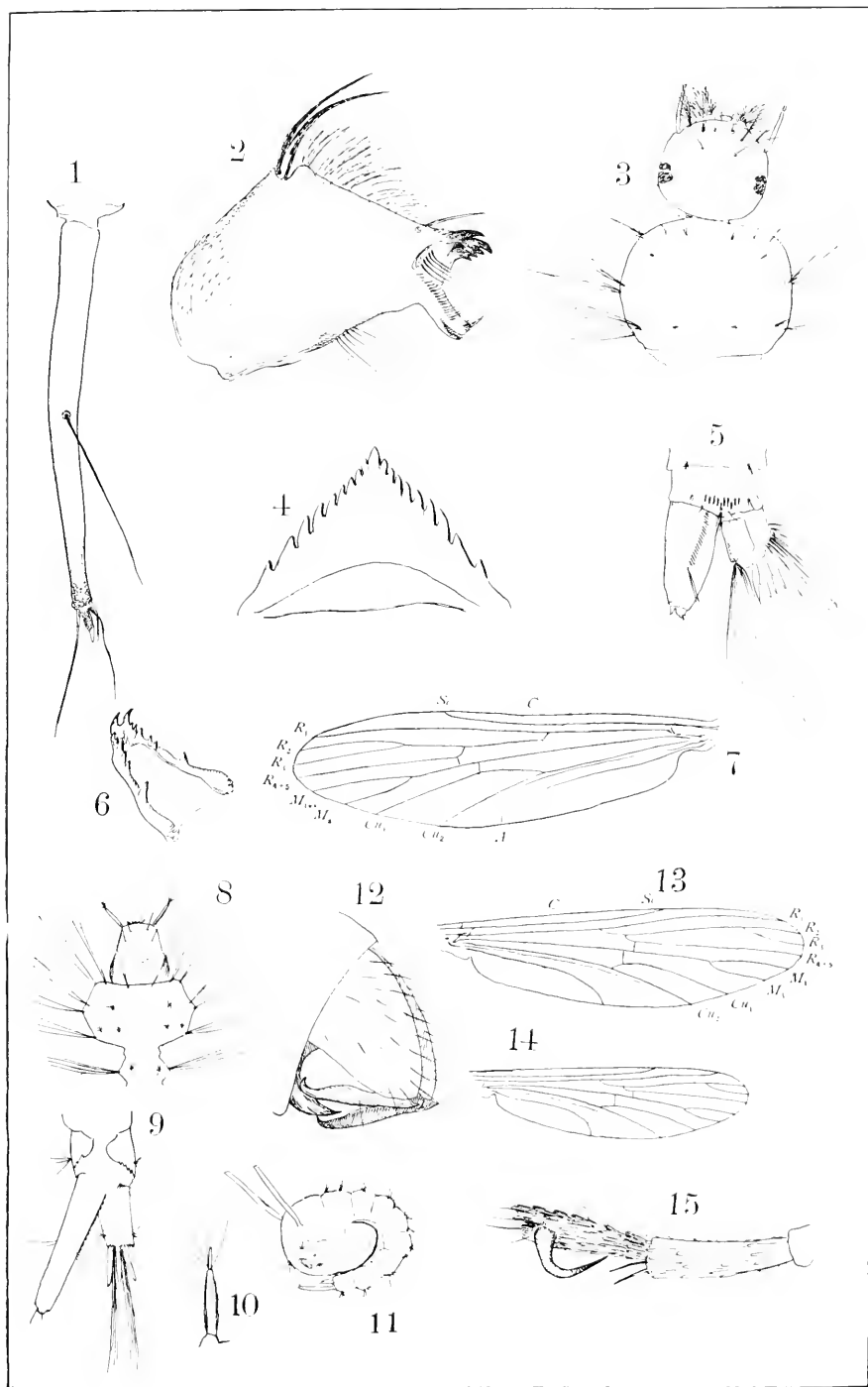
Culex pipiens



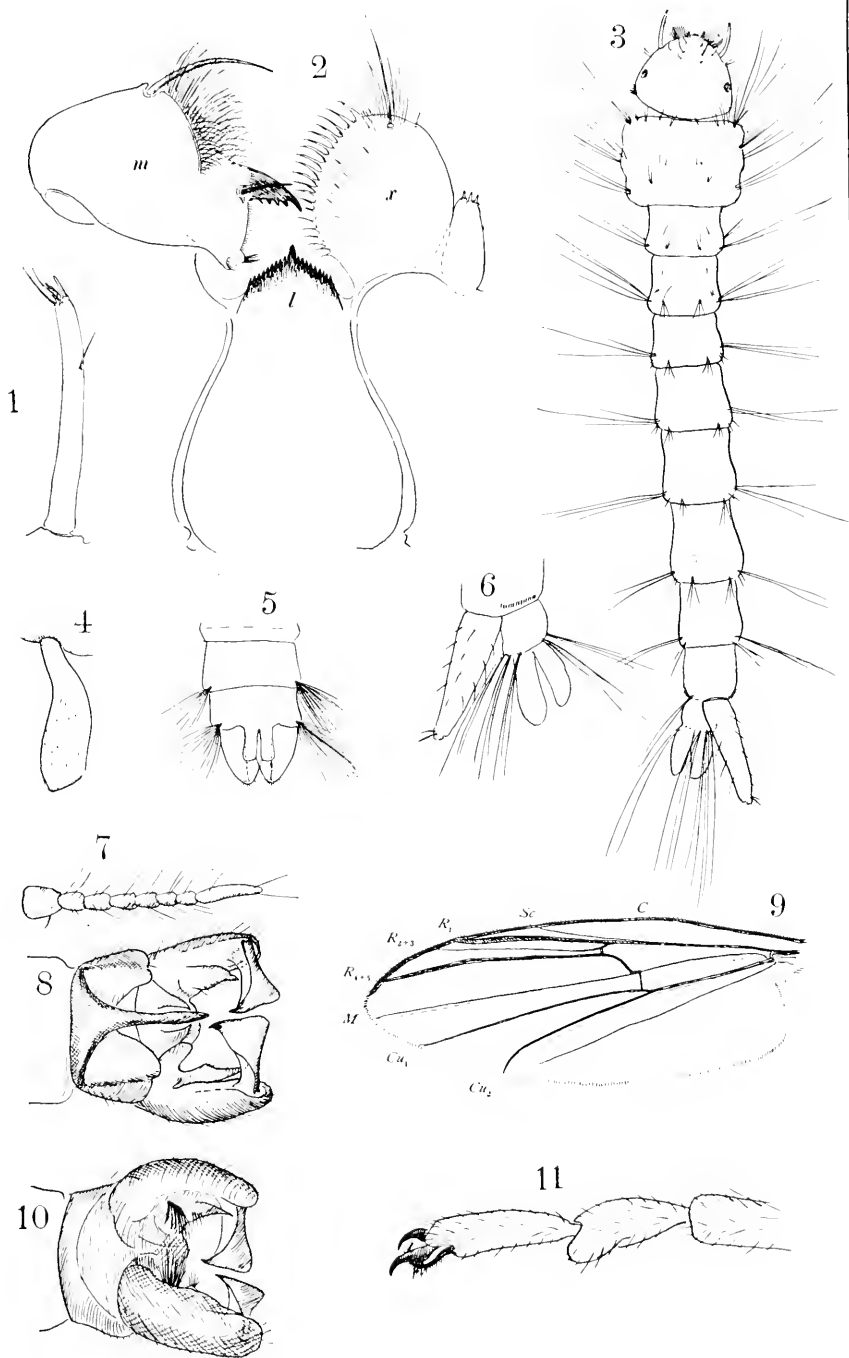
Culex restuans



Culex cantans

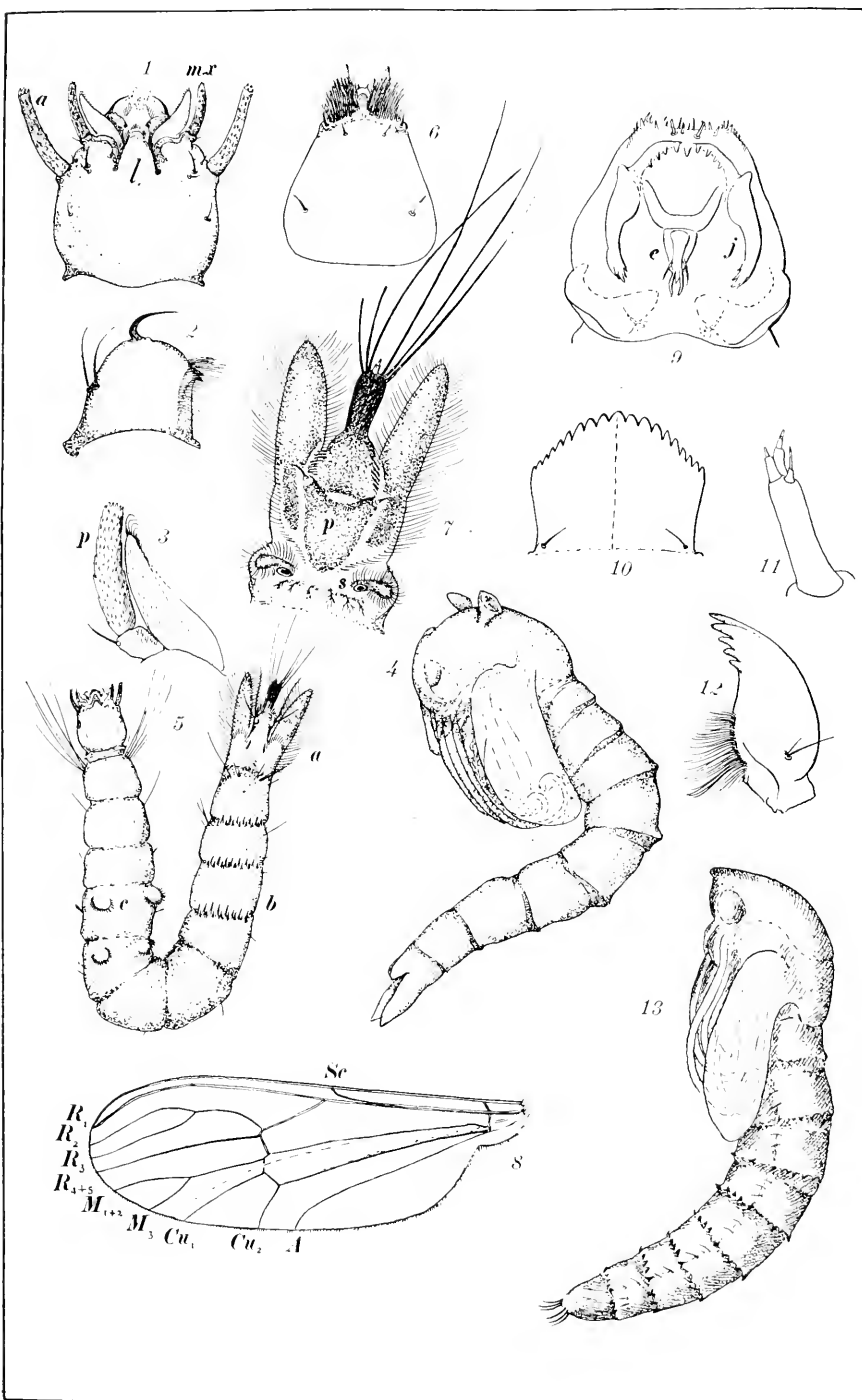


Culex triseriatus and *Uranotaenia sapphirina*

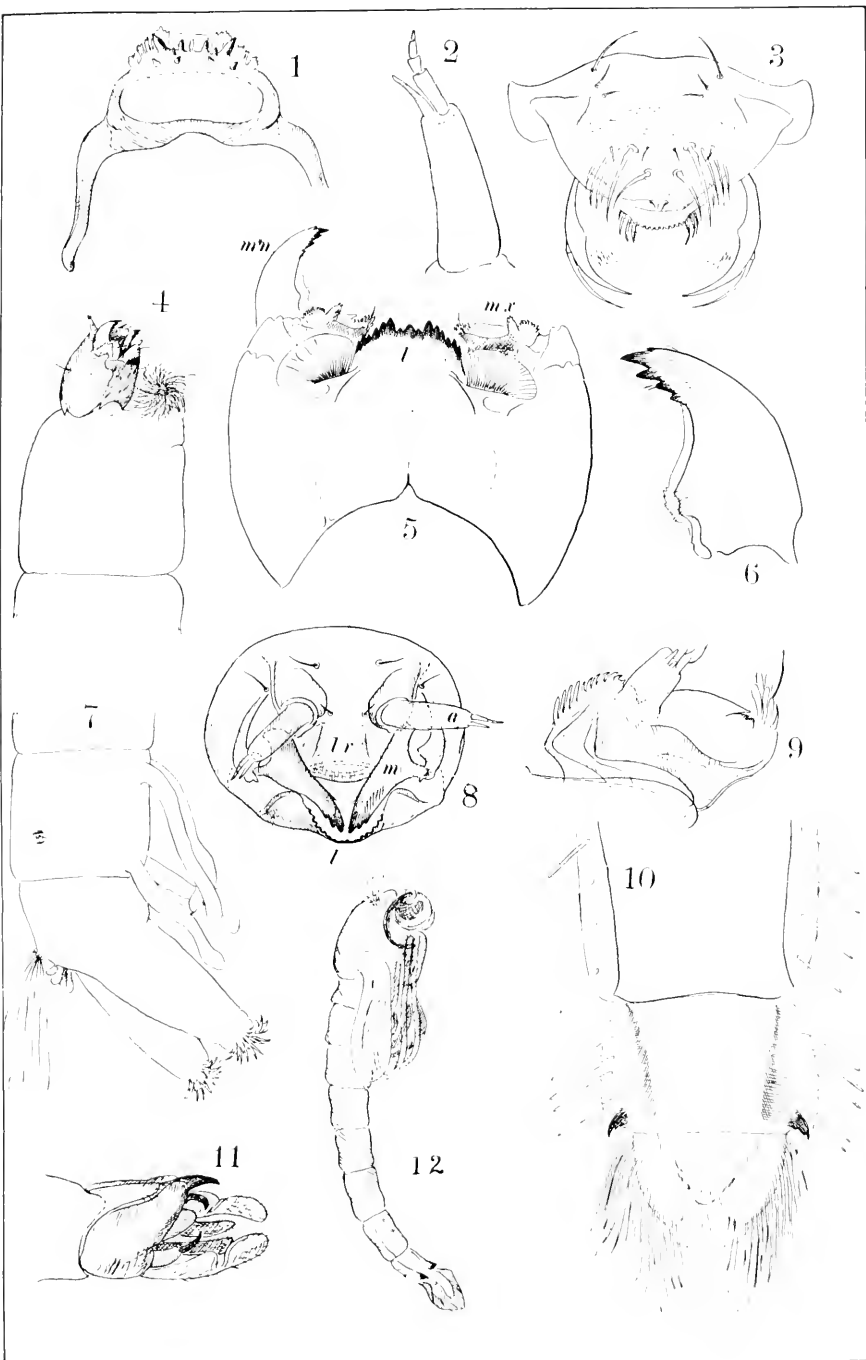


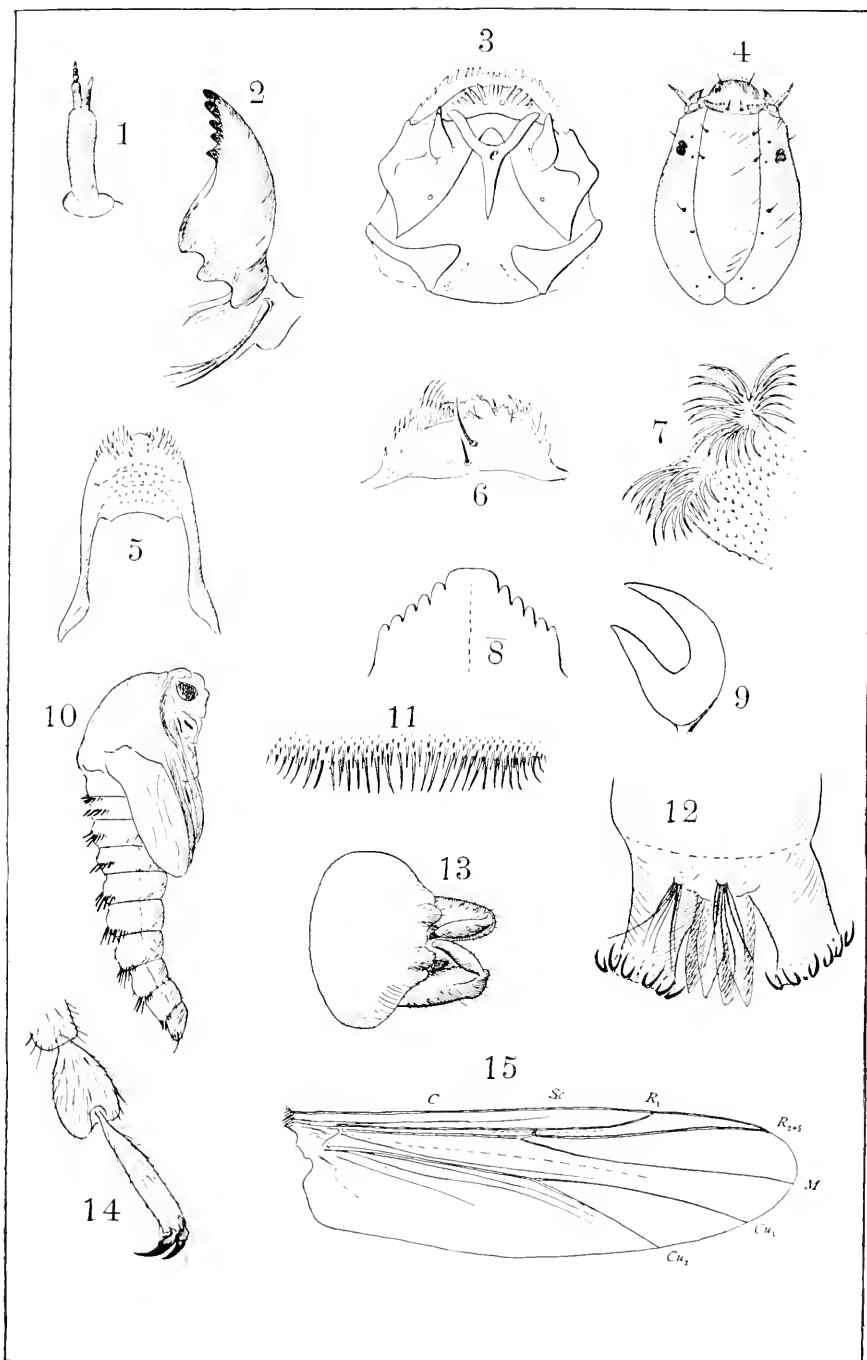
Aedes smithii and *Diamesa waltlii*





Dixia modesta and *Diamesa waltlii*





Thalassomyia obscura



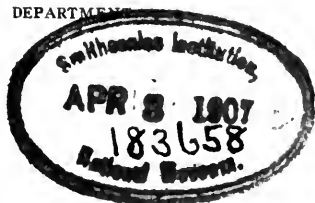
AQUATIC NEMATOCEROUS DIPTERA II

BY
OSKAR AUGUSTUS JOHANNSEN

Reprinted from N. Y. State Museum bulletin 86, May Flies and Midges of New York

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AQUATIC NEMATOCEROUS DIPTERA II

Chironomidae

BY OSKAR AUGUSTUS JOHANNSEN

The present work forms a continuation of the paper entitled "Aquatic Nematocerous Diptera," published in bulletin 68 of the New York State Museum (1903). In that paper the Blepharoceridae, Simuliidae, Culicidae, and the Dixidae were treated. In this paper the Chironomidae will be considered, the classification reviewed, the chironomid genera of the world described and discussed, and finally descriptions given of the imagoes of all known North American species except those belonging to the group *Ceratopogon* (sens. lat.). Descriptions will also be given of all larvae and pupae as far as known. The bulk of the material studied was collected in New York, but many specimens were obtained from the Mississippi valley, Rocky mountain and Pacific coast states. In drawing up the descriptions of the species upward of 5000 pinned specimens and much alcoholic material was studied. In order to save space the references to works of authors are abbreviated, only the author's name followed by a date is given, the complete reference being given in the bibliography in the back of the book. The study upon this family of flies was begun in the spring of 1901 and was continued throughout four seasons. The work was done in the entomological laboratory of Cornell university under the direction of Professor J. H. Comstock, to whom I wish to express my thanks for advice in the preparation of this work. I am also under obligations to Professor Kellogg of Leland Stanford jr. university, Professor C. O. Houghton of Delaware agricultural college, Professor Aldrich of Idaho, Mr. A. L. Melander of Washington State, and Doctors MacGillivray and Riley of the instructing staff of Cornell university; and especially to Professor J. G. Needham of Lake Forest university for specimens and many favors.

The family of the Chironomidae or midges comprises a large number of very delicate, and often minute flies, of which over 800 species are known throughout the world. They resemble mosquitoes in some respects, but are usually more delicate, and

The foregoing description was made no doubt entirely from dry examples. The words italicized and the stouter form of the inferior appendages are almost the only characters which served to separate the closely allied *A. cognatella*, a very critical species regarding which I have some doubt.

The superior (intermediate?) appendages of McLachlan, described by him as in the form of two contiguous yellowish bands very strongly curved downward, appear to be separate at the base only, the downturned tip being rounded. Between the divided base escapes the penis, which is not shown in the figures here. The construction of the so-called triangular pieces is very peculiar and their appearance depends much on the degree to which they are exerted.

The North American insect is practically identical with the European; the only difference appears to be in the upcurved contiguous median processes which are probably rather shorter and stouter in the American form. The latter was bred by Needham at Lake Forest in June, and he sent the same species from Chicopee Mass. (23 April '03). It will probably prove to be common in the Northern States.

Orthotrichia americana Banks ? (Ent. News 1904, p.116)

O. cristata Morton, U. S.

The dorsal plate in the ♂ is almost entire in its outer edge; from the one side, on the upper surface, arises a short hook, while on the other side, nearer the middle, arises a long, slender, much-curved acute process bent strongly inwards under the plate itself. The last ventral segment terminates in two separate blackish plates which are broadest where they approach each other, narrowing outwards, their apices bearing a spine; between these plates is a black appendage which seen from the side is hook-shaped and bears two spines. The seventh ventral segment with a process covered with strong thick blunt hairs; the sixth segment with a small tooth.

Lake Forest, Ill. (Needham).

The process on the seventh ventral segment is very similar to that found in the European *O. tetensii*.

AQUATIC NEMATOCEROUS DIPTERA II

Chironomidae

BY OSKAR AUGUSTE'S JOHANSEN

The present work forms a continuation of the paper entitled "Aquatic Nematoceros Diptera," published in bulletin 68 of the New York State Museum (1903). In that paper the *Blepharoceridae*, *Simuliidae*, *Culicidae*, and the *Dixidae* were treated. In this paper the *Chironomidae* will be considered, the classification reviewed, the chironomid genera of the world described and discussed, and finally descriptions given of the imagoes of all known North American species except those belonging to the group *Ceratopogon* (sens. lat.). Descriptions will also be given of all larvae and pupae as far as known. The bulk of the material studied was collected in New York, but many specimens were obtained from the Mississippi valley, Rocky mountain and Pacific coast states. In drawing up the descriptions of the species upward of 5000 pinned specimens and much alcoholic material was studied. In order to save space the references to works of authors are abbreviated, only the author's name followed by a date is given, the complete reference being given in the bibliography in the back of the book. The study upon this family of flies was begun in the spring of 1901 and was continued throughout four seasons. The work was done in the entomological laboratory of Cornell university under the direction of Professor J. H. Comstock, to whom I wish to express my thanks for advice in the preparation of this work. I am also under obligations to Professor Kellogg of Leland Stanford jr. university, Professor C. O. Houghton of Delaware agricultural college, Professor Aldrich of Idaho, Mr. A. L. Melander of Washington State, and Doctors MacGillivray and Riley of the instructing staff of Cornell university; and especially to Professor J. G. Needham of Lake Forest university for specimens and many favors.

The family of the *Chironomidae* or midges comprises a large number of very delicate, and often minute flies, of which over 800 species are known throughout the world. They resemble mosquitoes in some respects, but are usually more delicate, and

may be distinguished from them by their wing venation. These midges are often seen, especially in early spring or autumn, in immense swarms dancing in the air, and are frequently to be found at these seasons upon the windows of dwellings where they are often, perhaps usually, mistaken for mosquitoes.

Professor Williston relates (1896) that over meadows in the Rocky mountains he has seen them rise at nightfall in most incredible numbers, producing a humming noise like that of a distant waterfall, and audible for a considerable distance. Most of the species are inoffensive or actually beneficial as scavengers. The group *Ceratopogon*, however, forms an exception, some members of which, known as sandflies, or punkies, have the power of sucking blood, and are particularly troublesome in the mountains, along streams, and at the seashore. The Chironomidae are very widely distributed, being apparently as prevalent and as numerous in the frigid as in the torrid zone. There are about 500 European species, many of which were described by Zetterstedt, from Sweden and Lapland. Of the species hitherto described from North America over one third are from Alaska, Greenland and Hudson bay territory. A surprisingly large number of species are common to both Europe and North America. When the fauna of Asia, Africa and South America is as well known the total number of species will doubtless be increased many fold.

Geological distribution

One would scarcely expect the delicate, minute flies of this family to be preserved from mesozoic times, yet they seem to be not altogether unknown. Two species referred to *Macropheza* are figured, one by Geinitz from the Lias of Dobbartin and one by Brodie from the English Purbecks; two other obscure forms from the English Purbecks are figured under the name of *Chironomus*; and *Corethrum pertinax* and *Cecidomium grandaevum* of Westwood, from the same beds, appear to belong to this family rather than to the *Cecidomyiidae* or *Culicidae*. *Rhyphus priscus* Brodie, from the English Purbecks, also probably belongs here and not to the *Rhyphidae*.

The family is very abundant in amber, Loew having found seven species of *Tanypus*, more than forty of *Chironomus* and twenty-six of *Ceratopogon*. Giebel also describes two species of *Chironomus* and one of *Ceratopogon* in amber, and these genera had previously been recognized as occurring there by Burmeister, Erickson and others. Duisberg also records a peculiar genus, *Sendelia*, from the same. But the occurrence of the family in a fossil state is not confined to amber; thirteen species of *Chironomus* have been described from Rott, Oeningen, Rodoboj, and Utah, and the genus has been recognized also in Wyoming, while numerous pupae distinguishable as belonging to several species are recorded by Heyden from Rott. *Ceratopogon* has also a species at Rott, and it has been recognized at Aix and in Sicilian amber. Numerous specimens of the family occur at Florissant, but they are usually in very poor condition; they have also occurred in the British Columbian tertiaries. Scudder (1886).

Economic importance

The only function of the imago of the *Chironomid*, at least in the group *Chironomus*, and perhaps *Tanypus* also, is that of reproduction. Miall and Hammond (1900) say, "It is evident that *Chironomus* does not feed in the winged state. The mouth parts, though of elaborate structure, are never used in feeding, and the alimentary canal of the fly is empty, except for a greenish fluid, which fills the stomach of the pupa and newly hatched fly. . . . The larvae of *Chironomus* feed on dead leaves and other vegetable refuse. Microscopic examination of the contents of the stomach reveals a blackish mass of vegetable fragments, besides Diatoms, Infusoria, eggs of other aquatic animals and grains of sand."

Some species of the group *Ceratopogon* are blood suckers and their mouth parts as figured by Professor Kellogg (1899) seem admirably adapted to this function.

The larvae and pupae of the *Chironomidae* are of much importance as fish-food. Professor Needham (1903, p.204) mentions the fact that large numbers of the larvae of a species of *Chironomus* were taken from the stomachs of brook trout,

proving that these fish live almost exclusively upon "blood-worms," at certain seasons at least. Garman (1888) says: "Probably no other one genus of insect constitutes as important an item in the food of as large a number of fishes." While Forbes (1877) in giving a list of the organisms which form food of fishes records *Chironomidae* as occurring in the stomachs of many species.

Enemies

Besides the fish which devour vast numbers of *Chironomid* larvae, the nymphs of dragonflies, caddis worms, *Perla*, *Sialis*, beetle and other predaceous larvae constantly prey upon them; while the adults are eaten by dragonflies, by the net-winged midges (*Blepharoceridae*) and other predaceous insects. In a swarm of these midges very often one also sees a number of danceflies (*Empids*) constantly seeking victims.

Methods of capturing, rearing and mounting

Sweeping the low brush, rank grass, and herbage along the banks of ponds and streams is the usual way of capturing these flies, and often in a favorable location hundreds may be caught in a few hours; but the most satisfactory manner of catching is by means of a cyanide traplantern, such as is described by Professor Needham (1901, p.398). By means of it several thousand specimens may be taken in a single night. The most favorable time for setting the lantern is a sultry, cloudy night, during the summer or spring; and the most favorable location is near the bank of a pond or creek.

The larvae and pupae and sometimes the eggs also may be scooped from the bottom of the pond by means of a small coffee-strainer net; or swept by means of a brush into a cloth sagnet from the surface of the rocks at the bottom of the shallow creek as described by Professor Needham (1899, p.5). From thence they are transferred to jelly tumblers, or for those forms which require rapidly flowing water to a jar from which the water is drawn as rapidly as it enters by means of a continuous siphon as described by Professor Comstock in "Insect Life," p.330. If the larva is nearly full fed, but a short time will be required for it to transform. If the specimens are still quite small, some

dead leaves and rubbish may be put in the glass for them to feed upon. The larvae of *Chironomus* usually hide themselves from view, and in the mud and debris form tubes which open at the surface. When placed in a jar their chief anxiety is to bury themselves in the mud, and very soon they will gather bits of dead leaves and particles of sand about them, binding them together with viscid threads passed out of the mouth, and in a short time will be completely concealed in a rough tube. These tubes are frequently seen upon the surface of dead leaves, on stones, sticks, etc. One species is known to be a leaf miner (Pettit, 1900). The larvae of species belonging to the groups *Ceratopogon* and *Tanytus* usually do not form tubes, but remain free. Specimens captured in the fall may live all winter and not transform until spring. Some specimens of *Ceratopogon* taken by the writer in September lived until the following May in the larval stage, and it is probable that they live thus nearly a year. The larvae may be found all the year around, while the adults are common excepting in the dead of winter, and a few specimens may be found even at that season.

The larvae are best preserved in alcohol, either first killing them in hot water, or placing directly in the alcohol. If any peculiarity of color marking is observed it should first be noted, as the spirits soon remove much of the pigment. The adult should be mounted with great care, either upon an elbow pin (MacGillivray, 1903b), or upon a minuten nadel, a short and very slender headless pin, thrust through a small piece of cork or pith and then into the under side of the thorax of the fly. Through the other end of the cork an ordinary insect pin is placed, and the specimen is then ready for the cabinet. It is also very desirable to preserve some specimens of each species in alcohol, or better still, in a mixture of formaldehyde and glycerine. The latter preserves the original colors quite well, especially if kept in the dark. These specimens should be put in very small vials and should, of course, bear the same number label as the pinned specimen. The fore tarsi of the genus *Chironomus* are very easily broken off, and therefore it is quite necessary that great care should be observed in preserving them since their presence is necessary in the determination of

some of the species. It is the practice of the writer to remove one wing and all the legs from one side of at least one specimen of each species and to mount them (preferably dry) upon a slide; this method allows of ready measurement and comparison.

Characteristics of egg, larva, pupa, and adult

The adults may be characterized as follows: More or less mosquito-like in form, seldom reaching ten millimeters in length. The head is small, somewhat compressed, palpi usually four-jointed; proboscis short; antennae of variable length, from six to fifteen jointed; the first joint disk-like, the last one elongated, the male antennae usually plumose. Eyes reniform or oval; ocelli rudimentary or wanting. Thorax highly arched, frequently projecting over the head, without transverse suture; scutellum small and hemispherical; metathorax well-developed. Abdomen long and slender, eight-jointed, the hypopygium projecting forceps-like; ovipositor but little developed. Legs usually long and slender; coxae moderately long; tarsi frequently very long. Wings either bare or hairy; the veins of the costal margin being stout and in marked contrast with those in the other part of the wing, which appear to be fading out. Venation variable. The larvae usually have blood or tracheal gills, and are soft-skinned and worm-like. The pupae are free, some are active and resemble *Culex*, others float upon the surface of the water and still others remain at the bottom of the pond until ready to emerge.

The flies with which they might be confused are the crane flies and the mosquitoes. The former (*Tipulids*) are usually larger, have proportionately longer legs, have more numerous and more distinct wing-veins, and have a V-shaped suture upon the dorsum of the thorax. The latter (*Culicids*) have scales upon the wing, and all, excepting the subfamily *Corethrinæ*, have an elongate biting proboscis. The adults of the genus *Chironomus* have a peculiar habit of holding their fore legs high above the surface upon which they stand, while the mosquitoes usually hold up their hind legs.

There is one other family of flies, the *Stenoxenidae*, which must be distinguished from the *Chironomidae*. This

peculiar family has but a single genus, a single species, and is represented by but a single specimen, which is now in the United States National Museum. This family will fall in the couplet with the Chironomidae in the key given by Comstock (1895), and by Williston (1896), but differs from all the members of this family by its peculiar wing venation (pl.35, fig.29). The description of the family was first given by Mr. Coquillett (1899a).

The eggs

The eggs of most of the Chironomidae are deposited in water; some species in swift flowing water, others in sea or lake water, while most of them lay them in stagnant pools or ponds, or in slow flowing streams. The eggs of a few species are deposited in bark, in manure, and in debris. Some species lay them in strings resembling somewhat a miniature string of toad's eggs; while others lay them in clumps. The eggs themselves are elongate, cigar-shaped, usually pointed at each end. They hatch in a few days.

The larvae

The larvae are worm-like, but vary somewhat in form with the different genera. Most of them are aquatic, while a few live in the earth, in manure, or under bark (pl.16, fig.4; pl.17, figs.1 and 4; pl.19, fig.9).

Excepting some of the Ceratopogon they are provided with both thoracic and anal prolegs, and move by creeping in a manner somewhat like a geometer larva, without, however, such regularity, nor does the middle section hump up, but loops irregularly to one side or the other. Many species are blood-red in color, and hence are frequently known as blood-worms. They have a distinct head with well-formed labrum, labium, epipharynx, hypopharynx, mandibles and maxillae, the mandibles moving in oblique planes. The body is distinctly segmented, usually with twelve joints besides the head, the three thoracic segments being but little thicker than those of the abdomen. The twelfth segment is provided with a pair of prolegs, some caudal setae and blood gills; sometimes there are two pairs of conspicuous blood gills upon the ventral surface of the eleventh segment also. The

terrestrial larvae of *Ceratopogon* have prominent spines and setae upon the body, while the aquatic forms are nearly devoid of them (pl. 17, figs. 1 and 4). The aquatic larvae of *Ceratopogon* have no prolegs and the body is very slender and snake-like. The larvae can exist at great depths, and have been fished up from the bottom of deep lakes. They have been found in salt water (Packard, '70a).

The pupae

The pupae of *Chironomus* are frequently found in the old larval cases; others swim very freely near or at the surface after the fashion of a pollywog. The pupa of *Tanytus* is active and resembles that of *Culex* in form and habit. The pupa of the aquatic *Ceratopogon* is more elongate than *Tanytus*, is not active, and floats, nearly motionless, in a vertical position. All of the pupae have an enlarged thorax and usually a pair of respiratory tubes or filaments, while the caudal end is somewhat broadened and paddle-like or prolonged into two-pointed lobes, with ciliate margin.

The imagines

To the imaginal characters of the family already given the following may be appended:

The head is small, spheroidal, flattened where it joins the thorax, in some genera somewhat hollowed out between the eyes. The compound eyes are large, with conspicuous facets and distinctly separated from each other. They are kidney-shaped (reniform); that is, hollowed out around the base of the antennae. The ocelli are wanting. The front, the space between the eyes, is limited by the upper margin of the head and a line drawn through the root of the antennae. The vertex is the uppermost part of the front, near the margin of the occiput.

The face is the portion below the antennae, which is prolonged more or less downward to form the proboscis. The oral margin and an indefinite space immediately contiguous to it is called the epistoma or peristoma. The epistoma is usually convex, provided with setae or sensory hairs. The maxillary palpi are the slender, usually four-jointed appendages, the most conspicuous of the mouth parts. The labrum, hypopharynx and labium differ with

the different genera. In *Chironomus* and allied genera there is no trace of mandibles. In *Ceratopogon* the mouth parts are fitted for piercing. For homologies of the mouth parts, see Kellogg's papers in *Psyche*, 1899. The antennae or feelers are variable in form and number of joints; the first visible joint (called 2d joint by Miall and Hammond 1900) is usually enlarged, followed by a second which is sometimes also somewhat enlarged, these two being called the scape. These are always more or less differentiated from the remainder, which constitute the flagellum. In the male the joints of the flagellum are usually provided with long hairs. The first joint of Miall and Hammond (1900) is the extremely short hidden one, which is sunk in the head, and almost entirely occupied by the muscles which move the antennae to and fro. The next joint, the large one, exhibits a peculiar structure, which is believed to serve for the perception of sound. (M. and H. 1900, and Mayer 1874.) The head is connected with the thorax by a neck, whose cuticle is membranous.

The thorax is composed of three parts, the prothorax, the mesothorax and metathorax. The prothorax is quite narrow, forming a rounded collar back of the neck, within which are the muscles of the foreleg. On the dorsal surface it appears as a narrow band with a median incisure and suture. The humerus or humeral callus belongs also to the prothorax according to Miall and Hammond (1900). It is called the paratrene by Lowne. The mesothorax is very large; it is highly arched, and in some it projects somewhat over the head. On its fore edge is the anterior thoracic spiracle. The upper or dorsal surface of the mesothorax is often called the mesonotum, and it has attached to it at its posterior margin, and cut off from it by an impressed line, the scutellum, a small, semioval body, which really belongs to the mesothorax (see pl.31, fig.16, *Chasmatonotus*). The wings are attached to each side of and just below the scutellum. Behind and beneath the scutellum is a smooth and rather prominent oval-arched portion, the metanotum or upper portion of the metathorax (or post scutellum of Miall and Hammond 1900). Below and between the fore and middle legs is a very prominent hemispherical part (especially in *Chironomus*), the mesosternum. The sides of the body in front of the wings are called the pleura, and the under surface of

the thorax as a whole is called the sternum or pectus. The intermediate legs are attached to the hind part of the mesosternum by oval sockets. The metathorax is much smaller than the mesothorax. Its dorsal surface, called the metanotum, has already been mentioned. On the side is the posterior thoracic spiracle, and above it is the haltere (balancer or poiser) the rudimentary hind wing, a slender organ with a dilated head. The ventral surface of the metathorax is short and narrow and is largely occupied by the insertion of the hind legs.

The abdomen is composed of nine segments more or less closely fused together. In the male especially it is long and slender and terminates with the genitalia. The genitalia varies greatly with the different genera (pls. 32, 33). The anus opens on the dorsal surface of the ninth segment. The under surface of abdomen is sometimes called the venter.

The three pairs of legs are long and slender, especially so in *Chironomus*, are attached to the prothorax, mesothorax and metathorax, and are called respectively the front, middle and hind pairs. The older writers who used the Latin terminology spoke of the forelegs as *pedes antici*, the middle legs as *pedes medii*, and the hind legs, *pedes postici*. When they spoke of the fore and middle legs together they called them *pedes anteriores*. Some writers still use the term anterior legs for fore and middle pairs, and posterior legs for the middle and hind pairs. The coxa is the part attaching the leg proper to the thorax; while the trochanter is the short, small, ring-like portion between the femur and coxa. The femur or thigh is the stoutest portion of the leg; the tibia is the next part succeeding the femur. The tarsus is the distal division of the leg and is composed of five joints, of which the first, that next the tibia, is called the metatarsus. The ungues or claws are two hooklets on the underside of the last tarsal joint. In most genera these are simple, but a few have uniserrate or bifid claws. The pulvilli, two pad-like fleshy cushions attached to the last joint of the tarsus below the claws, are often present. The empodium is a median appendage between the claws, and is usually present also. The usual shape in this family is that of a sickle-shaped process, pectinate on the convex side.

The wings are usually rather slender and delicate, with the anterior veins (those nearest the costal border) rather stout, while the posterior veins are usually very delicate and indistinct. The surface of the wing is delicately hairy in a number of species, though the majority have bare wings.

Below is given the Comstock-Needham terminology of wing venation as used in this paper, together with the equivalent terms of the Schinerian system as applied with but slight modifications to the Nematocera generally:

Comstock-Needham	Schinerian
Costa (C)	= Costa
Subcosta (Sc)	= Auxiliary
Radius (R_1)	= First longitudinal
R_{2+3}	= Second "
R_{4+5}	= Third "
Media (M)	= Fourth "
Cubitus (Cu)	= Fifth "
Anal (A)	= Sixth "

The costa ends at or before the tip of the wing in all the genera; the subcosta, though sometimes rather indistinct, is usually present; the radius is stout and well developed, and usually with two or three branches, R_2 in some genera appearing like a crossvein; the media usually present and always simple; the cubitus is nearly always two-branched; anal vein usually present though delicate. Compare pl.17, figs.13-16, pls.27 to 31. The halteres, the slender organs with knobbed ends which are supposed to be the rudimentary second pair of wings, are rarely wanting.

For a description of the internal anatomy of both larva and imago the reader is referred to Miall and Hammond's work on the harlequin fly (1900).

A large number of genera have been erected to contain the species of the world. Of these some may be placed as the synonyms of others, leaving still over 40 valid genera. In order to facilitate identification a key to the North American genera is offered besides the more general one for the genera of the world.

KEYS TO GENERA OF THE CHIRONOMIDAE

Larvae

- a* Abdomen with prominent rounded elevations or cushions, with rows of teeth on the inferior (anterior) angles of the segments
13. *Psamatthiomyia*
- aa* Abdominal segments without these cushions
- b* Aquatic footless snake-like larva, or terrestrial larva with thoracic and anal feet, and many setae and bristles on body segments, pl.17, figs. 1 and 4. (*Group Cera topogon*)
- bb* Not as above
- c* With retractile antennae, the latter often quite long, long stilt-like legs, the caudal tufts of hair mounted on cylindrical processes, pl.19, fig.9. (*Group Tanypus*)
- cc* Not with all the above characters
- d* With the two caudal hair tufts mounted on cylindrical projections
- e* With six seta-like processes on each of the caudal projections, three long and three short. Eyes prominent, round, on anterior angles of the head, pl.34, figs. 21, 22, 23 (European)
26. *Wulpiella*
- cc* Eyes not on anterior angles of head
- f* With blood gills on venter of eleventh segment
31. *Hydrobaenus*
- ff* With blood gills only at end of twelfth segment
44. *Metriocnemus*
- dd* Caudal tufts on small rounded papillae
- e* Antennae elongate, at least one half and often as long or longer than the head; compare also pl.20, fig.10
- f* With two anal blood gills, pl.36, figs. 1, 2, 3
25. *Corynoneura* (Iemna)
- ff* With four anal blood gills; antennae mounted on basal prominence, pl.26, figs. 5, 8. 42. *Tanytarsus*
- ee* Antennae short
- f* Larvae usually blood red; eleventh body segment with two pairs of blood gills, pl.15, fig.4. .38. *Chironomus* (pt.)
- ff* Larvae greenish, yellowish, or whitish
- g* The maxillary palpus usually noticeably longer than broad. Larva in pools, pond water, or slow streams, pl.23, figs. 3 and 16. 38. *Chironomus* (pt.)
- gg* Palpus about as long as broad, pl.24, figs. 5, 12, 20
- h* Full-grown larva not over 6 mm. long, green or bluish-green in color. Anterior abdominal segments of greater diameter than the posterior ones. Mandibles often transversely wrinkled; the anterior prolegs usually with pectinate setae
 { 39. *Cricotopus*
 { 41. *Orthocladius*

hh Full-grown larva over 6mm. in length; mandible not transversely wrinkled

i Labium with its teeth rounded, pl.20, fig.9

35. *Diamesa waltlii*.¹

ii Labium with its middle tooth broadly truncate

37. *Thalassomyia fusca*

NOTE.—See addenda for several anomalous species.

Pupae

a Pupa floats nearly motionless in a vertical position at the surface of the water, pl.17, fig.11. (Group *Ceratopogon*)

aa Pupa not as above

b Active pupa swimming with a jerking motion in the water like a culex pupa, pl.19, fig.8. (Group *Tanyptus*)

bb Not culexlike

c With long setae or filaments at caudal end

d Caudal filaments very numerous and forming a caudal paddle, pl.22, fig.14, and pl.26, fig.15

e Thoracic respiratory organs a tuft of filaments, pl.16, fig.2

38. *Chironomus*

cc Respiratory organs consisting of a main shaft with lateral hairs or setae. Abdomen with setae and bristles.

42. *Tanytarsus*

dd Caudal appendage with long setae

e With eight long setae on each side of caudal appendage, pl.36, figs. 4 and 5. 25. *Corynoneura lemnae*

cc With a tuft of long setae on each side; thoracic respiratory organ a simple finger-like process, pl.34, figs. 5 and 8

31. *Hydrobaenus*

cc With three or four pairs of short setae, a plate-like sucker or with a paddle

d Plate-like sucker at caudal end, pl.34, figs. 14 and 15

29. *Telmatogeton* (St Paulii)

dd With two or three pairs of short setae or with paddle

e Without thoracic respiratory tubes. Abdominal segments with a fringe of conspicuous spines or setae or projections, pl.48, fig.13, and pl.50, fig.10 in Bul. 68 N. Y. State Museum, 1903

{ 35. *Diamesa*
37. *Thalassomyia*
44. *Metrioemus*

cc With respiratory tubes. Abdominal segments usually without a fringe of prominent setae, pl.24, fig.24, also pl.24, figs. 13, 14, 15

{ 39. *Cricotopus*
41. *Orthocladus*

¹The larva of *Thalassomyia congregata* (an European species) has a labium like *Diamesa waltlii*.

Imagines

NOTE.—In counting the antennal joints the large basal joint is included, but not the hidden first joint.

a Wings absent or rudimentary

- b* Wings reduced to mere vestiges, legs short and not slender, antenna with seven joints, mouth parts rudimentary, pl.36, fig.13, female

14. *Clunio**bb* Rudimentary wings reaching at least to the end of the first abdominal segment

- c* Halteres wanting, wings in the form of a flattened racket, tarsal claws with a little subapical tooth. Palpi four-jointed; antenna five (?) jointed.....10. *Belgica*

cc Halteres distinct

- d* Palpi four-jointed; antenna of the female four-jointed, of the male six-jointed, pl.35, figs. 16, 21, 22.....11. *Eretmoptera*

dd Palpi two-jointed; antenna of the female six-jointed

- e* Second joint of antenna like those following, monilliform, pl.37, figs. 5, 6, 7.....12. *Halirytus*

- cc* Second joint longer than those following; male antenna also with six joints, pl.35, figs. 4 to 9...13. *Psamathomyia*

aa Wings present

- b* The M-Cu crossvein present (i. e., cell M closed by a vein), pl.37, fig.24

c Antenna with twelve or more joints

- d* Antenna with fourteen joints usually plumose; fourth tarsal joint usually shorter than the fifth; wing bare, pl.30, fig.13, male

35. *Diamesa**dd* Not as above

- c* Antennae with fifteen joints both in male and female; plumose in the former; the vein M simple, pl.27, figs. 1 to 15

(Group *Tanyptus*)*f* Wing bare

- g* Fork of the cubitus petiolate.....15. *Procladius*

gg Fork of cubitus proximad of crossvein16. *Anatopynia* n. gen.*ff* Wing pubescent*g* Fork of cubitus proximad of crossvein

- h* Antennae of male and female each with fifteen joints, R_2 and R_3 distinct.....17. *Ablabesmyia* n. gen.

- hh* Antennae of female with twelve joints, the male with fifteen joints, R_3 indistinct (Australian genus)

18. *Isoplastus*

- gg* Fork of cubitus petiolate.....19. *Tanyptus*

- cc* Antennae with twelve or fourteen joints; wings hairy; cubitus not forked; anterior crossvein long and very oblique, pl.37, fig.1620. *Pentaneura*

cc Antennae with less than ten joints

- d* Crossvein near basal third of wing, pl.37, fig.11. Antennae about eight-jointed (Chile).....21. *Podonomus*

- dd* Crossveins near middle of wing
- c* Palpi six-jointed; antennae seven-jointed; wing venation as shown on pl.37, fig.21 (Chile).....22. *Heptagya*
- cc* Palpi four-jointed
- f* Antennae of female seven or eight jointed; male antennae fourteen-jointed; wing bare.....35. *Diamesa*
- ff* Antennae of female with eight joints, the male with nine, short-haired36. *Eutanyus*
According to the description the female of *Eutanyus* does not seem to differ from the female of *Diamesa*.
- hh* The M-Cu crossvein absent
- c* Wing with four or five very indistinct longitudinal veins; wing club-shaped, the anterior margin with a long curved seta, the antenna with about twelve joints.....23. *Corynocera*
- cc* Wing margin without a long curved seta
- d* Proboscis and palpi rudimentary; abdomen shorter than the thorax (female apterous).....14. *Clunio*
- dd* Palpi not rudimentary
- c* Antennae with not more than ten joints
- f* Antennae six-jointed
- g* The R-M crossvein, if present, at the basal quarter of the wing
- h* The R-M crossvein near basal quarter of the wing, pl.37, fig.13 (Chile).....24. *Spaniotoma*
- hh* The R-M crossvein coalescent with the longitudinal veins; wing club-shaped; the anterior cells thickened, pl.36, fig.7.....25. *Corynoneura*
- gg* The R-M crossvein near the middle of the wing
- h* Wings hairy; antennae with the four intermediate joints verticillate with very long hairs; male unknown (Europe), pl.34, fig.20.....26. *Wulpiella*
- hh* Wings with margin ciliated; antennae with sparse verticils of spreading hairs (Kerguelen Island), pl.37, fig.127. *Limnophyes*
- ff* Antennae with seven to ten joints
- g* Antennae with ten joints, not plumose; costal cell thickened, pl.36, fig.7.....25. *Corynoneura* (male)
- gg* Antennae with seven or eight joints
- h* Thorax with a longitudinal fissure; wings black with white markings, pl.31, fig.16, and pl.27, fig.16
28. *Chasmatonotus*
- hh* Thorax without this fissure
- i* Claws cleft, venation as figured; antennae seven-jointed in male and female, pl.34, fig.16
29. *Telmatogeton*

ii Claws simple

- j* Very small species; black, including its legs, wings and halteres; male with fourteen nearly bare joints, female with seven joints; legs with woolly hairs; metatarsi somewhat elongated; claws distinct, pl.34, figs. 6-11.....31. *Hydrobaenus*

jj Not such flies

- k* Antenna of male with eight joints; female like *Orthocladus*, (Australia), pl.36, fig.26

32. *Doloplastus*

- kk* Antenna of male not eight jointed; the female with seven joints

- l* Wings very short, in the female scarcely reaching the middle of the abdomen; the abdomen with a seta-like tubercle near the tip on each side; fore tibia longer than the metatarsus (Spitzbergen)33. *Smittia*

ll Wings of moderate length

- m* Thorax prolonged and bent downward; halteres hammer-like, pl.35, figs. 26, 27, 28 (Argentina). Synonym of *Chironomus*?

34. *Burmeisteria*

- mm* Thorax highly arched; halteres with knob

(Group *Chironomus*)

- n* The fourth tarsal joint obcordate, shorter than the fifth. { 37. *Thalassomyia*
45. *Scopelodromus*

nn Tarsal joint linear*o* Wings bare

- p* Front metatarsi as long or longer than the tibiae.....38. *Chironomus*

- pp* Front metatarsi distinctly shorter than their tibiae

- q* Legs black and white annulate, at least the fore pair...39. *Griecotopus*

- qq* Legs not so banded

- r* Posterior branch of cubitus sinuous, pl.30, figs. 1 to 4

40. *Camptocladus*

- rr* This branch straight, gently arched, pl.30, figs. 5 to 10

41. *Orthocladus**oo* Wings hairy

- p* Front metatarsi longer than their tibiae

42. *Tanytarsus*

- pp* Front metatarsi shorter than their tibiae
- q* Thorax produced conically in front over the head; hind tibiae dilated and hairy, pl.34, fig.24
- 43. *Eurycnemus*
- qq* Thorax moderately produced; hind tibiae not dilated
- 44. *Metriocnemus*
- cc* Antennae with thirteen to fifteen joints
- f* Antennae fifteen-jointed; European and tropic genera
- g* Wing hyaline; legs very long; antennal joints of varying lengths, pl.35, figs. 1, 2, 3.....30. *Macropeza*
- gg* Wings spotted (West Indies and Mexico)....5. *Oecacta*
- ff* Antennae with fourteen or fewer joints
- g* Thorax rounded and not produced over the head; antennae with thirteen or fourteen joints; legs of moderate length
- h* Antennae with thirteen joints; wing venation as shown on pl.35, figs. 10 and 14
- i* Palpi with three joints. (This is probably a synonym of the next).....2. *Tersesthes*
- ii* Palpi with four joints.....1. *Leptoconops*
- hh* Antennae with fourteen joints, plumose in the male, sparsely haired in the female; wing venation as on pl.17, figs. 13 to 16.....(*Group Ceratopogon*)
- i* Wings hairy; last joint of tarsus with an empodium
- j* Empodium well developed; almost as long as the claws, these without setae, pl.18, fig.7
- 3. *Ceratopogon*
- k* Hind metatarsi shorter than the second tarsal joint, or both of equal length
- (Sub. gen. *Foreipomyia*)¹
- kk* Hind metatarsus longer than the second joint
- (Sub. gen. *Ceratopogon*)
- jj* Empodium not so distinct, less than half as long as the claws; these furnished with setae on the under side. pl.18, fig.8.....4. *Culicoides*
- ii* Wings bare; pulvilli and empodium wanting
- j* Wing with R_1 distinctly separated from R_{2+3} and not connected with it by the crossvein-like R_2 , pl.17, fig.15.....6. *Bezzia*
- jj* Wing with R_2 present; cells sometimes indistinct. pl.17, figs. 13, 14, 16
- k* Media wanting. pl.17, fig.13
- 7. *Brachypogon*

¹According to Kieffer (1902) this subgenus can not stand, because in some species one sex would be classed here and the other sex with the next subgenus.

- kk* Media present.....(*Xylocrypta*¹)
l Femora unarmed.....S. *Ceratolophus*
ll Some of all the femora spinose beneath

9. *Palpomyia*

- m* Neither fore nor hind femora thickened²

- n* Having hairy soles (plantae)

1. Subgenus *Alasion*

- nn* Having spinose soles (plantae), pl.17, fig.16

2. Subgenus *Sphaeromyia*

- mm* Either fore or hind femora thickened

- n* Hind femora thickened, spinose beneath

3. Subgenus *Serromyia*

- nn* Fore femora thickened, pl.37, fig.9

4. Subgenus *Heteromyia*

- gg* Thorax produced over the head; legs usually quite long; antenna of the male usually with fourteen joints; that of the female with seven joints. (Go back to *ll* following *i*, 29 *Telmatogeton*, page 90, and read through to *qq*. *Metriocnemus*)

KEY TO GENERA OF THE NORTH AMERICAN CHIRONOMIDAE

- a* Wings rudimentary (Pacific coast), pl.35, figs. 15 to 24

11. *Eretmoptera*

- aa* Wings present

- b* The M-Cu crossvein present, pl.37, fig.24

- c* Antennae with fifteen joints; both in the male and the female the apical joint oval, pl.27. (Go back to the Group *Tanytus*, *f*, p. 89, of the preceding key.)

- cc* Antennae with fourteen or fewer joints, when the apical joint is oval then antenna with fewer than ten joints

- d* Antenna of the male with fourteen joints, the apical joint very long and cylindrical; antenna of the female with seven or eight joints; fourth tarsal joint obcordate; wings bare, pl.30, fig.13

35. *Dia mes a*

- dd* Antenna of male with nine joints, short haired; antenna of female with eight joints. The female does not appear to differ from

- Dia mes a*36. *Eutanytus*

- bb* The M-Cu crossvein absent

- c* Wing club-shaped, the costal cell thickened, pl.36, fig.7; antenna of male with ten, the female with six joints..25. *Corynoneura*

- cc* Not as above

- d* Thorax with a longitudinal fissure; wings black with white markings; antennae seven-jointed in male and female, pl.27, fig.16, and pl.31, fig.16.....28. *Chasmatonotus*

¹This division is called Genus *Palpomyia* by Kieffer (1902).

²This division is called Subgenus *Palpomyia* by Kieffer.

- dd* Thorax without a longitudinal fissure
- e* Claws cleft; antennae seven-jointed in male and female; halteres long (Alaska and Oregon).....29. *Telmatogeton*
- ee* Claws not cleft
- f* Antennae with thirteen to fifteen joints
- g* Antennae with fifteen joints; wings spotted (West Indies and Mexico).....5. *Oecacta*
- gg* Antennae with fourteen or fewer joints
- h* Thorax rounded, not produced over the head; antennae with thirteen or fourteen joints; legs of moderate length
- i* Antennae with thirteen joints; wing as figured, pl.35, fig.10. Palpi with three joints. (= *Leptoconops* Skuse?)2. *Tersesthes*
- ii* Antennae with fourteen joints; wing venation as figured, pl.17, figs. 13 to 16. (Go back to the Group *Ceratopogon* *hh* on p.92 of the previous key.)
- ff & hh* Thorax produced over the head, legs usually long; antennae of male with the fourteenth joint long, slender, and plumose (female with seven joints). (Go back to group *Chironomus* *mm*, p.91 of previous key.)

The subdivision of the Group *Ceratopogon* into smaller genera and subgenera as given in the first key is adapted from one given by the Abbe J. J. Kieffer (1902), with some slight modifications. The three South American genera *Psychophaena*, *Tetraphora*, and *Didymorphleps*, have been omitted from the key. They are probably synonymous with previously described genera, though from the brief descriptions it is impossible to say. They all belong to the Group *Ceratopogon*, and their descriptions are all reproduced upon a subsequent page.

Genus 1. *Leptoconops* Skuse

Proc. Linn. Soc. N. S. W. 288. 1889. (Pl.35, fig.14)

Antennae in female 211 jointed; first joint of scapus large, disciform; second smaller, globose; flagellar joints globose, gradually diminishing in size, more ovate towards apex, terminal joint elongate-ovate. Proboscis prominent. Palpi four-jointed; first and second joints small, third greatly incrassated, about three times the length of the first or second; fourth not as long as last, slender cylindrical; wings naked. All longitudinal veins taking their origin at the base of the wing. Venation as figured. Australian species.

Genus 2. Tersesthes Townsend

Psyche. 1893. 370. (Pl.35, figs. 10, 12, 13)

Antennae 13-jointed, set in large, circular excavations in the middle of the head; first joint largest, round; second more elongate, smaller, but larger than the following joints; last joint elongate conical; intermediate ten joints equal, submoniliform, with hairs somewhat shorter than width of joints. Palpi three-jointed, longer than proboscis, first joint shortest, second joint swollen, third narrow with a terminal whorl of hairs; proboscis consisting of a lower lip (labium), with the lancets free but usually more or less approximated to its anterior aspect, both of equal length, extending straight downward, about as long as the head; lancets serrate on the outer edge at tip. No ocelli. Eyes reniform, rather deeply excavated on the inside margin, dichoptic, front averaging one third the width of the head. Thorax moderately stout, but not humped, a little wider than the head, longer than wide, without transverse suture, scutellum prominent. Abdomen seven-jointed, somewhat elongate, not wider than the thorax, first three segments subequal, fourth smaller, three terminal segments narrowed, ovipositor exerted, consisting of two clavate pieces joined laterally on the basal half, and terminally divergent. Wings moderately broad, not elongate; hind margin with a delicate fringe of hairs, the surface sparsely clothed with very short, microscopic hairs (revealed only with a high objective); six longitudinal veins, first and second approximated, strongest, ending at about one third the length of the wing; third gently curved distally and ending near the wing apex; fourth apparently forked, fifth distinctly forked, sixth becoming obsolete before fork of the fifth; an apparent rudiment of a seventh vein; no crossveins, except one at extreme base of wing, which connects the first and sixth veins, marginal vein not extending beyond the tip of the wing. Legs slender, not dilated, coxae not elongate; hind tibiae spurred, middle and even front tibiae with microscopic spurs; metatarsi elongate, second joint of hind tarsi also elongate, of middle tarsi somewhat elongate, of front tarsi scarcely so, penultimate tarsal joint of all the feet shortened, the last and ante-penultimate joints about equal; no pulvilli.

Professor Mik in the Wiener Ent. Zeitung, 1894, p.164, says: ".....Dieses Geader lässt sich ohne Mühe auf jenes der Gattung *Corynoneura* Winnertz zurückführen (Vergl. V. d. Wulp Dipt.—Neederl. 1877. Pl.VIII. fig.6), ohne dass ich hiermit etwa den Bestand der Gattung *Tersesthes* anzweifeln möchte" Upon comparison of this description with that of *Leptocnops* Skuse. and of pl.35, fig.10, with fig.14, it will be seen that these genera are certainly very closely related if not identical. The only marked difference is that *Leptocnops* has two small basal palpal joints while *Tersesthes* is said to have but one (i. e. *Leptocnops* has four-jointed and *Tersesthes* three-jointed palpi). Only one species.

***Tersesthes torrens* Townsend**

1893. *Tersesthes* Town. Psyche. 371

Female. General color blackish; eyes dark brown; antennal excavations cinnamon color, nearly three times the diameter of first antennal joint; front, face and lancets shining black, the front with four blackish hairs on vertical margin arising from four papillae; antennae black, clothed with whitish pubescence; palpi blackish, labium brownish with some whitish pubescence terminally; occipital orbits with a few black hairs. Thorax and scutellum deep shining black, smooth, glabrous, except that the thorax has some scattered black hairs anteriorly. Abdomen soft opaque brown, varying to light brown, in some of the specimens flavous or rufous at base; balsam mounts showing two oval black spots (bodies?) at base of fifth segment; ovipositor brownish. Legs blackish, tarsi brownish, tibiae slightly so. Wings grayish hyaline, with hardly a smoky flavous tinge, the delicate fringe of hind margin somewhat longest on anal angle where it terminates abruptly; veins pale, except first and second longitudinal veins, which are brown and end in a brown stigma on costal margin (the first vein becomes obsolete just before reaching stigma); halteres brownish, knobs whitish.

Length of body (inc. ovipositor), one and three-fifths millimeters (empty) to two and one-fifth millimeters (abdomen distended with blood); of wing one and one-fifth millimeters. Fresh and alcoholic specimens are slightly longer. Described from both dried and alcoholic specimens and balsam mounts. Six specimens collected June 21, on Continental divide, Socorro county N. Mex., 7000 ft.

GROUP CERATOPOGON Meigen

Illiger's Mag. 11:261. 1803

This group may primarily be divided into two series; those species having hairy wings belonging to one and those with bare wings to the other. The larvae of the former group usually live under bark, while those of the latter are aquatic. The larvae of the first group may be characterized as follows: The head is short, the antennae minute, the mouth parts are small, and the mandibles apparently move in a more or less vertical plane. The mandibles in some species have several apical teeth (pl.17, fig.6). The body consists of 12 well-marked segments of which the first three, usually a little larger than the following, belong to the thorax. The head, thorax, and abdomen are provided with various spines, setae, and tubercles, differing with the species. On the ventral surface of the first thoracic segment is the anterior proleg, a short, more or less cylindrical process, divided into two branches, at the tip of each of which is a crown of a few claws (pl.17, fig.7). The last abdominal segment has a pair of prolegs, each with a few bilobed claws (pl.17, fig.8). Blood gills appear to be present and consist of delicate white filaments. The pupae of the members of this group remain partly sticking in the larval skin, the thorax and the first three or four abdominal segments projecting out (pl.17, fig.9). The thorax is large, prominent, the respiratory trumpets (fig.9, *t*) when present are small and inconspicuous; the abdominal segments variously armed with spines and setae.

The eggs and the method of egg laying of several members of the second group will subsequently be described. The larvae of the second (aquatic) group swim well with a writhing snake-like motion. They are usually whitish in color, slender, 12-jointed (not counting the head), the thoracic segments shortest; the middle abdominal segments of the greatest diameter, and the last segments usually longest (pl.17, fig.1). The head is very small, somewhat elongate, oval, with a pair of eyes, each eye consisting of one or two pigment spots. There are usually a few setae upon the head. The antennae (pl.18, figs.1a and 3a) are very small and inconspicuous, and in all species which I have seen, two-jointed. Of the mouth parts the

mandibles are the most conspicuous, slender at the tip and simple, but enlarged basally (pl.18, fig.4). The labrum is rounded and provided with one or two pairs of papillae, which may be larger than the antennae and of similar construction (pl.18, fig.1b). The maxillae (fig.2*mx*) are fleshy, lobed, and each provided with a large two-jointed palpus (p). The labium is quite small and inconspicuous, and differs from the corresponding part in *Chironomus* in having a soft and rounded edge, but upon its inner surface forming the floor of the mouth cavity it is heavily chitinized and formed into one or more cephalad projecting teeth (pl.18, fig.2*l*). The thorax and abdomen are wholly without prolegs; usually with but few or no setae excepting at the caudal end where there are about eight long setae and a few short ones. Projecting from the rectum, when not retracted, may be seen the delicate white blood gills.

The pupa is brownish, somewhat tapering, with an ovate thorax. It floats nearly motionless at the surface of the water, or is attached to plants a little above the surface but still within the water film. The respiratory trumpets are slender, and more or less cylindrical with the aperture slightly enlarged (pl.18, figs.9 and 10*l*). The abdominal segments are provided with spines, setae and tubercles. The anal fin ends in two pointed lobes (pl.18, fig.11). Professor Mik, on page 183 in Vol. 7 of the *Wiener Ent. Zeit.*, described a species of *Ceratopogon* with hairy wings, but having a footless larva. This form occupies a place between the above two groups; and its habitat, the very moist or wet, ulcerous parts of the stems of *Aesculus hippocastanum*, also suggests an intermediate form. This species differs from all known members of both groups in possessing instead of either setae or prolegs a retractile disk, on the periphery of which are arranged five pairs of curved spines. It agrees with the second group in having no prolegs, and with the first in having a mandible with a three-toothed margin.

The pupa has cylindrical, elongate respiratory trumpets; the abdomen is provided with spiny tubercles, and the caudal end has a crown of tubercles. The adult would be classified with Kieffer's genus *Culicoides*.

Another aberrant form, *C. murinus* Winn. is noted by G. Gereke on p.164, Wiener Ent. Zeit. Vol. 5. The larva was not observed, but the pupa, although of an aquatic form, gave rise to a hairy winged adult. The respiratory trumpets of this species are quite peculiar. They are elongate, cylindrical, and then suddenly contracted on the apical third. An Ithaca, N. Y., specimen, bred from the slender snake-like aquatic larva, also gave rise to a hairy winged adult. The larval skin was unfortunately lost. The pupa has a cylindrical breathing trumpet resembling the one described by Gereke.

The imago. The imagines of the group *Ceratopogon* are very small flies, commonly called "punkies," which differ from the other genera of this family in having more robust legs, in their wing venation, and in their not having the thorax projecting over the head. To this group belong the genera *Ceratopogon* sens. str., *Culicoides*, *Bezzia*, *Brachypogon*, *Ceratolophus*, *Palpomyia* (with its subgenera *Alasion*, *Sphaeromyias*, *Serromyia* and *Heteromyia*), and probably *Oecacta*, *Psychophaena*, *Tetraphora* and *Didymorphleps*.

Head flattened in front; epistome slightly projecting; palpi four-jointed, the second joint longer or thicker than the others, the fourth almost as long as the second; proboscis somewhat projecting; formed for biting; antennae elongated, filiform, 14-jointed, the first joint annular, the following eight spherical or somewhat annular; in the male long plumose, in the female with few hairs, the last five joints in both sexes elongated, especially in the male, and furnished with short hairs; eyes reniform, the ocelli wanting. Dorsum of the thorax very convex, scutellum narrow, metanotum short. Abdomen eight-segmented, rather long, sometimes narrowed basally. Genitalia somewhat prominent. Legs moderately long and quite robust; especially the femora, which are often furnished with spines or setae; tibiae sometimes flattened; tarsi various, the claws with or without teeth or setae. Wings bare or hairy, folded over the back when at rest; the media simple, the cubitus always two-branched; wing venation of the types shown on plate 17, figs. 13 to 16; halteres distinct and uncovered.

Genus 3. *Ceratopogon* sens. str. (Kieffer)

Bul. Soc. Ent. Fr. 69. 1899. *Ceratopogon* Meigen pt. (1803).

(Pl.18, fig.7)

Wings long-haired, especially those of the female. Last joint of the tarsus with very apparent and hairy (not setose) empodium.

Other characters as in the group *Ceratopogon*. Type species *C. bipunctatus* Linn. There are numerous American species belonging to this genus.

Ceratopogon sp.

(Pl.17, figs. 4 to 8)

The larvae of this species were found under oak bark. They are five or six mm. long, bristly, cylindrical, tapering slightly from the thorax to the caudal end; color whitish. Head dark brown, eye spots and mouth parts blackish; each of the thoracic feet armed with a circle of about eight simple, blackish claws (fig.7), anal feet each with nine or ten bilobed blackish claws (fig.8). The mandible is as shown in fig.6. The chaetotaxy of the head and body is shown in figs. 4 and 5. Each segment of the abdomen has upon each side a long, honey yellow curved bristle with slightly enlarged end, two slightly curved black, barbellate bristles, two slightly curved long black setae, and upon the dorsum a pair of honey yellow spear-shaped setae. The thoracic segments are similarly armed, except that the first has two slender yellow setae instead of the spear-shaped pair.

The pupa is 2.5 to 3 mm. in length, yellowish, head darker (fig. 9). The thorax with a triangular shield-like dorsum, with a pair of yellow barbellate blunt filaments anteriorly, laterally and posteriorly; and a short pair in front of the reddish imaginal eyes. The respiratory trumpets (fig.9t) are small, rather inconspicuous, with the apical end enlarged. The mesothorax has two barbellate filaments; the first four abdominal segments each with eight yellow, pointed, delicately barbellate filaments and two shorter blunt ones. The remaining segments, which are concealed in the cast larval skin, are unarmed; the apical end is provided with a pair of slender, pointed lobes.

Only one specimen of the imago was reared and is not sufficiently well preserved to describe. For further descriptions of larvae and pupae of members of this genus the reader is referred to Mr W. H. Long's paper (1902).

Subgenus *Forcipomyia* Megerle in litt

Meigen Syst. Besch. 1:59. 1818

Labidomyia Stephens Catl. Brit. Ins. 1829

The manuscript name *Forcipomyia bipunctata* Linn. was given to the species now known as *trichopterus* Meig., by Megerle and later Stephens grouped the species *bipunctata*, *trichopterus*, *pictipennis* Meig.,

nemorosus Meig., *nemoralis* Meig., and others under the name of *Labidomyia* without giving a description of the genus. The type species *trichopterus* has the characters of *Ceratopogon* sens. str., but has its metatarsus shorter, or no longer than the following joint, and the venation of the type shown on the pl. 17, fig. 14. The Abbe J. J. Kieffer, however, says this subgenus cannot stand because that in certain species the male would be classed as *Forcipomyia* and the female as *Ceratopogon*.

Genus 4. *Culicoides* Latreille

Gen. Ins. et Crust. 4:251. 1809. (Pl. 18, fig. 8)

Antennae filiform, 14-jointed, hairy; the second and the six following, cylindrical ovate; the four or five following these rather more elongate, subcylindrical, the last one largest, ovate cylindrical. The proboscis markedly longer than the head, conical. The wings deflected, the venation resembles that figured on pl. 17, fig. 14. The type is *C. pulicaris* L. (*Ceratopogon punctata* Meigen). Kieffer (1902) characterizes the genus as follows: The surface of the wing with long hairs, at least that of the female; the tarsi with minute pulvilli not half as long as the tarsal claws, the latter with long setae at the bases. A number of North American species belong to this genus.

Genus 5. *Oecacta* Poey

Memorias Hist. Nat. Cuba. 1:236. 1851

Judging from the description and figures given by Poey this genus is very closely related to either *Ceratopogon* or *Culicoides*. The only important distinction given in the description is the statement that there are fifteen antennal joints instead of fourteen. From the figure given it appears that the author had counted the basal articulation beneath the large basal joint as one, which would only make fourteen joints as reckoned for *Ceratopogon*. The wing venation, assuming Poey's drawing to be strictly correct, does not differ so markedly from a typical *Ceratopogon* as to exclude it from that genus. The venation resembles that shown on plate 17, figure 14, excepting that R_2 does not quite reach the margin, and R_3 seems to be wanting. R_1 terminates in the stigma. Since Professor Townsend (1897), who has seen this fly, did not question the validity of the

genus, I shall for the present regard it as distinct. The following is an abstract of Poey's description:

Antennal joints, fifteen; palpal joints, five; ocelli, tibial spurs, and pulvilli wanting; wings hairy; cells few in number; sexes similar. The antennae of the male appear to be a little more hairy than those of the female.

***Oecacta furens* Poey**

Memorias, etc. 1:236. Tab. XXVII. 1851

Length 2 mm. from the head to the end of the wing; thorax bronze colored, spotted with fuscous; abdomen fuscous; legs whitish, the articulations and a ring upon each femur and tibia, fuscous; front and antennae rufous; wings whitish, spotted with fuscous; halteres yellow. The wings are broad, covered with minute scales and with a conspicuous fringe on the margin.

Townsend (1897) says: "Dry pinned specimens show the wings to be strongly iridescent in certain lights, the dark and white spots alike, as well as the veins and whole wing surface, especially noticeable being various rich shades of blue and violet. Poey remarks at some length on this peculiarity. When the wing is held up to the light and looked through the dark spots appear faint, excepting only the elongate rectangular black stigma; this can be seen with the naked eye."

Cuba (Poey); Mexico and Jamaica (Townsend).

Genus 6. *Bezzia* Kieffer

Bul. Soc. Ent. Fr. 69. 1899

Belongs to the group *Ceratopogon*. Wings bare, tarsi without empodium, radius 3-branched (i. e. without the cross-vein-like R_2). (Pl. 17, fig. 15). Type *C. ornata* Meigen. Several American species belong to this genus.

***Bezzia setulosa* Loew**

1861 *Ceratopogon* Loew, Berl. Ent. Zeit. 312

(Pl. 18, figs. 4, 5, 6, 9, 10, 11)

The larvae were found in the Renwick swamps, Ithaca, N. Y., July 10th. They are white without brown markings and about 7 mm. long. The head is brown, each eye consists of two nearly contiguous spots. On the dorsal surface of the head are several pair of small setae. The labrum is rounded, with two pairs of small apical papillae, one pair apparently jointed, and one or two

pairs with setae. Mandibles curved, slender at the apex, stout basally (fig.4). The hypopharynx lies rather far back from the mouth opening, about on a line with the eye spots. It is curved, like the jawbone of a mammal, the dorsal surface of the middle section being fringed. In fig.5 this fringe is flattened down. The labium is rounded, and has a single cephalad projecting tooth on its inner surface. Upon the outer surface are two setae on each side (fig.6). The body is wholly devoid of setae excepting at the caudal end. At the caudal end there are eight long setae arranged in four groups of two each (pl.17, fig.3). Besides these there are four very small and delicate ones. The blood gills (retracted in most specimens) are white, short, slender, and lanceolate in outline.

The pupa is dark brown in color, with the abdomen slightly paler. Length 3.5 to 4 mm. The respiratory trumpet is slightly enlarged at the apical end (pl.18, fig.9), about five times as long as wide. Upon the dorsal surface is a group of about ten small setae. Upon the dorsal surface of the first abdominal segment there is a group of five or six very small setae on each side. The following segments, excepting the last two, have from 6 to 10 setae on the dorsal surface, arranged as shown in fig.10. Upon the ventral surface each segment has from 8 to 10 very small setae, each placed on the apex of a prominent tubercle (fig.11). The anal fin consists of two pointed lobes with blackened tips.

To Loew's description of the imago (loc. cit.) may be added that the fore and middle tibiae sometimes have one or two stout black setae besides the fine hair-like setae; and in the female each claw has a very small tooth on the inner side. The male genitalia as shown on pl. 32, fig. 1.

Bezzia sp.

(Pl.17, figs. 10 to 12)

The larvae were taken from the stomach of a brook trout at Saranac Inn, N. Y. They do not appear to differ much from the larvae of *B. setulosa*, excepting that the labium possesses three teeth on the inner surface instead of one (fig.10). The pupa (fig.11) may possibly belong to this species, for it is the only species which was found in that vicinity at that time, but of it many specimens were found. The respiratory trumpet is as shown in fig.12. Each abdominal segment has upon its ventral surface several elongate brown spots. The setae are short, and the basal tubercles smaller and fewer than in *B. setulosa*. The lobes of the anal fin are elongate and pointed (fig.11).

Adults bred from the pupae described above were preserved in alcohol, and hence the color characters are somewhat doubtful.

Female. Brownish, abdomen pale, legs brown and white, claws simple, no pulvilli nor empodium; fourth tarsal joint one-half as long as the fifth, posterior tarsi ciliate with hair-like setae, last joint with only a few hairs; wings bare, without the crossvein-like R_2 ; length 3.5 mm. Head and mouth parts brownish; antennae brown with white incisures; basal joint brown. Thorax brown (perhaps cinereous in dried specimens) with indications of dorsal stripes. Abdomen brown dorsally and white ventrally. Coxae brown, fore and middle legs white, with brown knees and articulations, hind legs brown, basal $\frac{2}{3}$ of the femora, basal $\frac{1}{5}$ of the tibiae, and of metatarsi whitish. In some specimens the fore and middle femora and tibiae have a brown ring near or beyond the middle, and the posterior femora are wholly brown. Sometimes the posterior tibiae also have a whitish ring near the tip and the hind tarsi whitish. Halteres white with the tip of the knob sometimes darkened.

Genus 7. *Brachypogon* Kieffer

Bul. Soc. Ent. Fr. 69. 1899

Belongs to the group *Ceratopogon* distinguished by having the wings bare, in having media coalesced with R_{4+5} , the branches of the radius coalescent, pulvilli absent. (Pl.17, fig.13). Type *Ceratopogon vitiosus* Winn. No North American species have thus far been described.

XYLOCRYPTA Kieffer

Genus *Xylocrypta* Kieffer. Bul. Soc. Ent. Fr. 69. 1899

From the other genera of the group *Ceratopogon* it is distinguished in having the wings bare, the media simple, and the tarsal claws with teeth. Type species *Ceratopogon fasciata* Meigen.

Xylocrypta Kieffer is made a synonym of *Palpomyia* Kieffer by its author (1902). The name may be retained for a group, including species, having a wing of the type shown on pl.17, fig.16, and having femora either with spines (genus *Palpomyia*) or without (genus *Ceratolophus*).

Genus 8. *Ceratolophus* Kieffer

Belongs to the group *Ceratopogon*. Wings bare; media simple, R_1 and R_2 connected by the crossvein-like R_2 (resembling *Palpomyia* pl.17, fig.16); femora unarmed.

This name was first given by its author (Kieffer 1899*b*) to a genus characterized thus: The wings are bare, the media simple, the tarsal claws without teeth. Type of the genus is *Ceratopogon femoratus* Fabr. This species has now been made the type of the subgenus *Serromyia* (q. v.). In a later paper Kieffer (1902) made *Ceratolophus* a subgenus of *Palpomyia*. But since, according to Skuse (1889), *Palpomyia* has the femora armed, *Ceratolophus* better be retained as a distinct genus. Several American species.

Ceratolophus sp.

The egg-laying of this species was observed by Professor Needham, Dr. A. D. MacGillivray and the writer in July. The little flies hover in considerable numbers near the rocks over which the spray of Fall creek dashes. Selecting a suitable spot upon the rock, above the surface of the water, but splashed by the spray, the female begins egg-laying. The eggs are laid rapidly, about two per second, until several hundred eggs have been set up on end, side by side in a little clump of about 5 mm. in diameter. Upon a single suitable rock many clumps may be found. The eggs when first deposited are white, but they soon become black. Another species not determined lays a similar clump of eggs on the surface of the pond lily leaves. The larvae which emerge I was unable to distinguish from newly hatched larvae of other species.

Imago. Black, legs paler, length 2 mm. Head subshining black; mouth parts and antennae fuscous, the basal joint of the latter black. Thorax wholly shining black, when viewed obliquely a little pruinose. Abdomen dull black, the first and last joints brownish. Femora yellow, the hind pair brown on the apical half; the fore tibiae yellow, the middle pair pale brown, the hind ones dark brown. All tarsi brown. All legs with few hairs and no prominent setae. Wings hyaline, bare. Halteres black. The crossvein-like R_2 is situated near base of the radial cell. Ithaca, N. Y.

Genus 9. *Palpomyia* Megerle in litt.

Meigen, Syst. Besch. 1:65. 1818. Stephens, Catalogue Brit. Dipt. 238. 1829

On page 238 of his Catalogue of British Insects (1829) Stephens affixes this name to all species of Meigen's group B of *Cera-*

topogon. The name was first published by Meigen as a manuscript name of Megerle's, for a species belonging to the above-mentioned group, a group characterized as having the flexor surface of the fore femora spinose.

Accordingly, and as Skuse (1889) has already stated, *Palpomya* may be defined thus: Belongs to the group *Ceratopogon*; wings bare, with five radial cells, R_2 present; media simple; some or all the femora spinose beneath; pulvilli and empodium wanting.

Kieffer (1902) in his definition for the genus includes also those species whose femora are without setae; but it seems to me that Skuse's interpretation of the genus has the claim of priority, thus leaving *Ceratolophus* as a distinct genus and using the name *Palpomya* for those species having setose femora.

Subgenus 1. *Alasion rondani*

Dipt. *Prodromus*. 2:14. 1857. (= *Apogon*, *Prodromus*.
1:175. 1856. *Preoc.*)

In the analytical table *Apogon* is briefly described as follows: Femora, at least the anterior pair, spinose beneath; antennae of the male verticillate with short hairs as in the female. Spec. typ.; *Ceratopogon hortulanus* Meigen. On page 14, *Prodr.* II. '57, Rondani changes the name *Apogon* to *Alasion* on account of preoccupation.

C. hortulanus is made a synonym of *C. flavipes* by later authors. These authors say nothing of the short-haired antennae of the male, and it appears that there is perhaps some error here on Rondani's part. The type species *C. flavipes* is placed among the *Serromyia* by Bezzi. This seems unwarranted since the hind femora are not thickened. In the table given by Kieffer (1902) it would fall in the division with *Palpomya*.

The name might stand as a subgeneric name as one of the divisions of *Palpomya*. It may then be defined as follows: Wings bare, R_2 present, crossvein-like; media simple; some or all the femora spinose beneath, not thickened; the soles (plantae) of the feet hairy, not spinose; in this last character distinguished from *Sphaeromyia*. Several American species.

Subgenus 2. *Sphaeromyas* Stephens

Catalogue Brit. Dipt. 236. 1829; Curtis Brit. Ins. 6:285.
(Pl.17, fig.16; pl.18, figs. 13, 14)

In the figure given by Curtis the tarsal claws resemble Winertz's (1852) pl.I, fig.15a, and the wing pl.VIII, fig.63.

Wing bare, five radial cells, R_2 present, crossvein-like; media simple; some or all the femora spinose beneath; terminal joint of the tarsi armed with a double row of spiny bristles, each claw (at least in the female) with a tooth on the inner side. Belongs to group *Ceratopogon*. Type of the genus *C. fasciatus* Meigen (= *albomarginatus* Steph.). Several American species.

Sphaeromyas argentatus Loew

1861 *Ceratopogon* Loew. Berl. Ent. Zeit. 310

The egg-laying of this species was first observed by Professor Needham, by whom my attention was called to it. During the latter days of June and the first of July about sundown the female fly hovers about three or four inches above the water's surface close to the shore in a place sheltered by the shrubs and weeds. With the head pointing toward the shore and the body swaying rhythmically laterally to and fro, the egg-laying begins. The eggs are enclosed in a gelatinous ribbon, placed at right angles to the long axis. A short section of this ribbon with the eggs side by side is shown on pl.31, fig.9. The ribbon when deposited is about 1.5 inches in length, flat, and appears wrinkled like a paraffin ribbon. The lateral swaying of the body at the beginning of the egg-laying is of about one inch amplitude, but as the ribbon of eggs increases, the amplitude decreases until just before deposition it is less than $\frac{1}{2}$ inch. When the egg string is about $\frac{1}{4}$ inch long the fly seizes it with her hind and middle legs, the hind legs guiding, the middle legs paying out the string as its length increases. The fore legs are folded up under the body. This egg-laying process occupies from three to five minutes; when completed the fly suddenly darts down to the water's surface, deposits her eggs and flies away.

The eggs when first laid are whitish, but later, as development progresses, they become brown. Each egg is about 0.4 mm. in length by .07 in width; somewhat pointed at one end and

flattened at the other, the latter with a minute rectangular bolster with knobbed corners.

The larvae emerge in the course of four or five days; a slender, white, snake-like creature, differing in no wise from the full grown *Ceratopogon* larva excepting that it has a relatively larger head; the posterior end has the usual setae. None were reared to maturity, hence no dissections could be made of the head, nor were any pupae obtained. The imago has been fully described by Loew (1861).

Subgenus 3. *Serromyia* Megerle in litt.

Meigen Syst. Besch. 1:66. 1818; *Prionomyia* Stephens. Cat'l Brit. Ins. 237. 1829; *Ceratopogon* pt. C. Meigen, Stephens, loc. cit.

The name *Serromyia* was first published by Meigen as a manuscript name of Megerle's for *Ceratopogon femoratus* Fabr. Later, in 1829, Stephens places into the *Prionomyia* all of Meigen's *Ceratopogon* group C, the members of which have the hind femora thickened, and spinose beneath. According to both Skuse (1889) and Kieffer (1902), the genus may be defined as follows: Wings bare, the crossvein-like R_2 present; hind femora thickened, and spinose beneath. Belongs to the group *Ceratopogon*. Several North American species.

Subgenus 4. *Heteromyia* Say

Amer. Ent. 2:79. 1825; and Compl. Wr. 1. (= *Pachyleptus* Walker. Ins. Saunders Dipt. 426. 1856.)

Heteromyia may be considered as a subgenus of *Palpomyia* and defined thus: Wings bare, the vein R_2 present, crossvein-like (resembling pl.17, fig.16); media simple; femora spinose beneath, fore femora thickened (pl.37, figs. 8 and 9). Say's description is as follows:

Artificial character. Antennae porrect, filiform, 14-jointed, five terminal joints elongated; palpi exerted, four-jointed; basal joint shortest, a little contracted in the middle; ocelli none; eyes reniform; posterior feet much elongated, slender, and with a single nail at the tip; anterior pair with somewhat elongated coxae, and much dilated femora, armed with a series of short spines on the anterior edge, on which the arcuated tibia closes.

Natural character. Body moderately slender; head small, rounded, flattened before; antennae in the middle of the face; first

joint large, but not long; the eight following joints suboval; the five terminal joints long, not dilated, cylindric, each being twice the length of the preceding ones; eyes reniform, large, wider beneath, and approaching above; stemmata none; palpi arcuated, four-jointed, first joint shortest, last joint longest; proboscis shorter than the head; thorax subglobular, convex above and projecting a little forward acutely before; beneath convex; scutellum transverse; wings moderate, somewhat lanceolate; poisers naked; feet unequal; anterior pair with the coxae somewhat elongated; thighs dilated, and with a series of spines on the lower side; tibiae arcuated, accurately closing on the inferior surface of the thigh; tarsi moderate; intermediate pair slender, longer than the anteriors; third pair longest, slender, the tarsi elongated, terminated by a single long and slender nail.

In specimens of *Heteromyia fasciata* Say, I find the wing has the crossvein-like R_2 though very delicate and indistinct.

Walker's description of *Pachyleptus* agrees exactly with that of Say. Arribalzaga (1893) redescribes the genus at length for a specimen in his possession. *Heteromyia fasciata* Say, differs from Arribalzaga's description of *Pachyleptus* in the following particulars: Face convex and not keeled; the apical joint of the palpus is longer than the second and third, which are subequal; and the hind tarsi which are much elongated have only the first and second joints subequal, the others being shorter. As these differentiating characters are of specific rather than generic importance, I think *Pachyleptus* should be considered a synonym of *Heteromyia*.

In one particular only may there be a chance that the two genera are distinct. In Walker's description nothing is said of the wing venation excepting the statement that the veins are like those of *Ceratopogon* in structure; but Arribalzaga states that R_2 is wanting. This condition agrees with the figure given by Say (pl.37, fig.8). In the type species, however (*H. fasciata*), this vein is present, at least in all the specimens that I have seen, although it is quite delicate and indistinct. Should it be found that certain species do have this vein and others do not, the former may be called *Heteromyia* and the latter *Pachyleptus* Arribalzaga (= *Pachyleptus* Walker?).

There are several North American species.

Walker's (1856) description is as follows:

Pachyleptus. Nearly allied to *Ceratopogon*. Body slender; head small, nearly round; palpi moderately long; antennae mutilated; thorax convex; abdomen nearly cylindrical, somewhat contracted towards the base, much more slender than the thorax, and almost twice its length; posterior legs rather long and slender; femora subclavate; fore legs raptorious; femora thick, tibiae slightly curved, closely applied to the femora; wings narrow; veins like those of *Ceratopogon* in structure.

Ceratopogon sp. sens. lat.

(Pl. 18, figs. 1-3)

The larvae were found in Eddy pond, Ithaca N. Y., in April. They are white with brown markings; length 8-9 mm. Head brown; each eye consists of two nearly contiguous spots; antennae two-jointed and very short; setae on the head as shown in figure 3. The labrum (fig. 1) is rounded, with a pair of jointed and a pair of simple papillae. The mandible is shown in fig. 3m, the maxilla in fig. 2m.v., the latter has a prominent two-jointed palpus, labium (fig. 2l) rounded, with three cephalad projecting teeth on the floor of the mouth cavity. The segments of the thorax are marked with brown, the first with three blotches on dorsal surface, the second with two lateral spots, and two longitudinal lines which rise at the anterior margin and extend half the length of the segment, the third with two nearly contiguous spots on each side, and a pair of spots on its anterior margin. Each abdominal segment has a pair of elongate spots at the anterior margin, a dorso-lateral and a ventro-lateral stripe, the latter prolonged anteriorly and joined by a transverse fascia at the incisure; a fine median central stripe is produced forward from the transverse fascia. These stripes vary in length, in some specimens forming almost continuous longitudinal stripes along the abdomen. Setae of caudal end are about eight in number, comparatively small, and arranged not in pairs but singly. Pupa and imago not obtained. Of this species specimens have been kept living in aquaria from October to April.

Ceratopogon sp. sens. lat.

Professor A. S. Packard (1870) published an account of a larva and pupa which belongs to the group of the bare-winged *Ceratopogon*. It is described as *Tanytus* sp. to which genus it certainly does not belong. The larva and pupa were found at Clear Lake, Lake county, California. The description states that the caudal end is without bristles or hairs of any

kind. It is said that the pupa has no respiratory appendages, the only peculiarity which would distinguish it from other known species belonging to this group.

Genus *Psychophaena* Phillipi

Verh. z. b. Ges. Wien. 628. 1865

Proboscis equalling the head in length; palpi four-jointed, third joint thickened, obconate, the fourth a little shorter, slender and cylindrical; antennae pilose, 14-jointed (also of the male?) the first joint thickened, the following seven subglobose and (in the female at least) not petiolate, the rest elongate, the apical one lanceolate; the posterior margin of the wing with long cilia; legs pilose, not spurred, the metatarsus longer than the following joints. The wing venation resembles fig.14, pl.17, but the media separates from R_{4+5} a little distad of the forking of the cubitus, this forking being almost as far distad as the tip of the radial veins. The radial cells short. Type *P. pictipennis* Phillipi (Chile). This genus as defined does not differ from *Ceratopogon* or *Culicoides*.

Genus *Tetraphora* Phillipi

Verh. z. b. Ges. Wien. 630. 1865. (Pl.37, fig.18)

The antennae equal in length, the head and the thorax taken together, about 12-14 joints, moniliform, verticillate with long hairs, the basal joints subglobose, the intermediate ones narrowed apically, bulbous. Wings hairy, venation as in fig.18. Legs long, the first tarsal joint about as long as the four following. Type *T. fusca*. Phil. (Chile). From the figure of the wing it appears that this genus is probably a synonym of either *Ceratopogon* or *Culicoides*.

Genus *Didymorphleps* Weyenbergh

Stettiner Ent. Zeit. 44:108. 1883. (Pl.35, fig.25, after Weyenbergh)

The wing venation and other characters as figured and described by Weyenbergh is essentially that of a *Ceratopogon* or *Culicoides*, but according to this author is said to present some differentiating characters. The cilia of the anterior wing margin are coarse and bristle-like and of equal length; those of the posterior margin are more delicate and of

unequal length. The entire wing is so thickly covered with microscopic hairs that it appears nearly opaque. There are several peculiarities in the venation to which the author calls attention. The R_{4+5} does not reach the margin; parallel to and above it is a vein (perhaps a fold) which enters the margin; the latter vein is not connected with any vein at its base. Above this is a forked vein (fold) which has no connection at its base. This is absent in the female. This forked vein or fold is of common occurrence in many *Ceratopogon* wings. Upon each side of the cubitus there is a vein (probably a fold) running parallel to it. These folds are absent in the female. The halteres have prominent knobs. According to the text (but not the figure) the vein which enters the anterior wing margin before the mid-length of the wing has a point of contact with the bend of the one which enters the anterior margin a little distad of the middle. The legs and antennae are like those of *Ceratopogon*. In regard to the male antennae the author says: "Das 2te Glied diese Fühler hat der langen Haarbush welcher *Ceratopogon* kennzeichnet, aber an der Spitze ist es so zu sagen gaffelig frisirt und seine Innenseite nicht so glatt wie die Aussenseite, weil erstere kleine borstige Haare zeigt welche ein wenig vorragen."

Each joint of the antennae of the female possesses four long hairs, each hair about as long as the antenna.

Type of the genus *D. hortorum* Weyenbergh, l. c.

It does not appear that the venation differs materially from some species of *Ceratopogon*. Compare the wing of *C. rostratus* Winn., pl. IV, fig. 23, Winnertz (1852). The other characters given certainly do not distinguish it, and therefore this genus must be considered as a synonym of either *Ceratopogon* or *Culicoides*.

Genus 10. *Belgica* Jacobs

Ann. de Soc. Belgique. 106. 1900

The head somewhat rounded, longer than high, a little wider than the thorax. Face flat, the eyes not emarginate, placed at half the height of the face, "eyes not smooth." Antennae inserted opposite the eyes, a little lower than their transverse

diameter, with five distinct and separated joints; the first joint short, cylindrical, cut obliquely from without to within, the last joint as long as the third and fourth together, with truncated base and rounded tip. The antennal joints are provided with hairs, the last with longer and stouter ones. The fifth joint in certain specimens appears to have a suggestion of a division simulating a sixth joint. The epistome is prolonged, triangular, and truncate. The palpi not more slender than the antennae, have four joints, the last joint being one-half as long as the one preceding. The thorax is produced over the head, the humeri are prominent, the center of the thorax is arched, and widens out to the abdomen. The scutellum is triangular with truncated apex. Legs.—Anterior coxae are prominent, first pair is somewhat separated from the following pair, the femora are compressed and widened; the tarsal claws with a little subapical tooth and two pulvilli. The wings are stumpy, in the form of a flattened racket, more or less developed according to the specimen. Halteres are wanting. The abdomen is 8-segmented; in the male it terminates ventrally with a large plate carrying two lamellae covering the genitalia; with the female these organs are hidden in the abdomen. Translation from the original. The genus was erected for two Patagonian species, *B. antarctica* and *B. magellanica*.

Genus 11. Eretmoptera Kellogg

Biol. Bul. 1:82. (Pl. 35, figs. 15 to 24)

Under this name Professor Kellogg published a description of a maritime fly which bears such a resemblance to the genus *Psamathomyia* Deby that I at first considered them synonymous. There appear to be, however, several characters which may be of sufficient importance to separate them generically. In *Eretmoptera* the maxillary palpi are four-segmented, while in *Psamathomyia* they are two-jointed; the female of the former has four-jointed antennae, while both sexes of the latter have six-jointed antennae. The remaining distinctive characters seem to be of specific rather than of generic value. The flies were collected December 27, 1898, by Mr J. C. Brown at Point Lobos, a rocky point on the Pacific

coast near Monterey, California. The flies, of which there were many, were resting or running on the surface of the ocean water of the tide pools, and had a tendency to gather in large numbers in "patches" and "in ball like masses" on the surface of the water. None were seen below the surface, nor were any seen flying. They moved about on the surface of the water very rapidly. The following is a description given by Professor Kellogg, of the species:

Eretmoptera browni Kellogg

Biol. Bul. 82. 1900

Male (fig.21). Length 2 mm. Head slightly broader than the thorax, eyes widely separated, very small, very convex, hairy, and with rather large facets; ocelli absent; antennae (fig.22) short, length 3 mm.; six-segmented, the basal segments wide and globose, the sixth segment longest, the second next, the third and fifth about equal, the fourth shortest, with a few short strong hairs on each segment; and the surface everywhere with a fine stiff pubescence. The mouth parts are of simple *Nematocercous* type, short, and with distinct labrum-epipharynx, maxillae, hypopharynx, and labium; mandibles absent; labrum-epipharynx (fig.19) short, broadly triangular, with obtusely rounded tip. Maxillae with short, weak, tapering, pointed lobe, and 4-segmented palpi, 3 mm. long; the palpi with the last two segments longest and equal, and all the segments provided like the antennae with a few short stray hairs and a fine stiff pubescence (fig.16); hypopharynx (fig.18) elongate, triangular, as long as the labrum-epipharynx, but narrower and more acute; labium (fig.17) short, lip-like, with free paraglossae, without pseudo-tracheae. The face is whitish with a median longitudinal dark line, and the antennary fossae with dark margins; the basal segment of the antenna is rather dark, the other segments pale. Thorax without bristles, dark above, pale beneath. Legs long and slender, whitish with blackish joints; middle and hind legs longest and equal, front legs only a little shorter; average measurement of middle leg, femur 1 mm., tibia 1 mm., tarsus 1 mm.; tarsus 5-segmented, segment one as long as segment two, three and four together; segment five slightly longer than segment four; tibiae of all legs with a single apical spur; tarsal claws strongly curved, thickened at base, with three delicate spines on basal half; no pulvilli; empodium (fig.15 emp.) rather long, curving, filiform, and plumose or pectinate for its whole length. Wings narrow, strap-like, extending only to fourth abdominal segment, length .75 mm., and wholly without veins; whitish, somewhat wrinkled,

and finely spinulose (fig.21). These strange veinless wings are not especially thin or delicate, but on the contrary are rather thickened, the costal margin being especially thickened and perhaps folded. The halteres (fig.20) or the structures which occupy the usual position of the halteres, are not of the usual pedicel and knobbed type common among *Diptera*, but are minute lobe or scale-like processes, appearing like rudiments of metathoracic wings; like the mesothoracic wings, they are rather thickened and finely spinulose; they are widest at the base and taper to a rounded tip; they average .08 mm. in length. Abdomen with nine segments, tapering gradually posteriorly; mottled blackish and gray above, lighter below, palest laterally; a few scattered, small, wholly inconspicuous hairs, the body appearing glabrous; external genitalia consisting of a pair of large, conspicuous, strong, articulated claspers (fig.24) which are covered with a pubescence.

Female. Length 2.5 mm., thus being $\frac{1}{4}$ longer than the male; this extra length is all in the abdomen, which is markedly larger than the abdomen of the male in every way. The head and thorax are narrower than the robust abdomen, which is sub-cylindrical, tapering only slightly posteriorly. Eyes as in the male very small, very widely separated, and hairy. Antennae only 4-segmented. Mouth parts essentially as in the male, with, however, appreciable differences in shape; the labrum-epipharynx is narrower at base, and is more pointed apically; the labium with paraglossae separated farther back and slightly narrower. The reduced wings and halteres like those of the male, the wings' length .85 mm., slightly elongated. The abdomen consists of nine segments mottled blackish, with conspicuous white sutural spaces, caused by the distension of the abdomen. The external genitalia are inconspicuous. There is a short, emarginate dorsal plate with rounded tips and a pair of lateral processes. There appears to be no extrusible ovipositor.

Pupa of female. A single pupa taken with the imagines from a tide pool. Length 2.5 mm. Immediately recognizable as pupa of the female from the similarity in size, shape and markings. Abdomen just as in the adult in regard to size, shape, color and markings. The antennae, legs and wings are folded on the lateral and ventral aspects of the anterior part of the body, and extending backwards to (hardly reaching) the posterior margin of the second abdominal segment. There are no external tracheal gills or elongated spiracles (breathing tubes). There are no bristles nor special clinging organs. The pupa is of a very simple, unmodified, unprotected type.

Genus 12. *Halirytus* Eaton

Ent. Mo. Mag. 12:60. 1875. (Pl.37, figs. 5, 6, 7)

Imago, female. Head suborbicular, palpi very short, two-jointed; antennae divergent, six-jointed, the basal joint very large, nearly orbicular, the next four much smaller, submoniliform, the apical joint oval, about as long as the preceding two together; the basal joint has one rather short and a few still shorter bristles near its middle, and the apical joint has a short bristle on one side, and a finer hair on the other side near its base, and some extremely minute pubescence, which is hardly discernible even under the microscope (fig.7); genae each with one minute bristle below the eye; epistome scutiform; eyes suborbicular, protuberant, close to their upper orbit behind are three short bristles, the hinder two are near together; ocelli absent. Mesonotum somewhat cucullate, being strongly arched in front and projecting forwards above the head; scutellum semi-elliptical, prominent, with a transverse line of minute erect bristles; metanotum very transverse, exceedingly short; the spiracles on each side of the mesothorax are very prominent; wings rudimentary, somewhat narrowly obovate, reaching to the apex of the first abdominal segment; halteres small, clavate and slender; legs very long, the posterior tibiae not thickened nor spurred; the proximal joints of the tarsi very long, unguis and pulvilli very small. Abdomen with seven dorsal and six ventral segments (exclusive of the base supporting the valves of the ovipositor), subcylindric; ovipositor pointed obliquely downwards, composed of a stout basal joint terminated by a pair of acute short lanceolate lamellae enclosing a smaller pair of spicules. Male unknown.

The larvae probably feed on *Entomophaga*. The species is found on the Kerguelen Island. Type of genus is *H. amphibius*, Eaton.

This genus is akin to *Corynoneura*, from which it is separated by its two-jointed palpi, the comparative nakedness of its antennae, its entire eyes, the spurless tibiae of which the hind pair is not thickened, its rudimentary wings, and perhaps by the number of abdominal segments. If the portion reckoned above as the base of the ovipositor be regarded as a segment, then there is no difference between these genera in that last particular.

All the known species of *Corynoneura* are extremely minute. In the original diagnosis the number of the segments was said to be five; they were enumerated from below, and the proximal segment was taken to be metathoracic.

The foregoing description is taken from Verrall's article in Phil. Trans. of the Royal Soc. of London, vol. 168, p.246. The figures on pl.37 are also copied from Verrall. No North American species.

Genus 13. *Psamthiomyia* Deby

Journ. Royl. Micr. Soc. 180. 1889. (Pl.35, figs. 4 to 9)

This genus was erected for a small *Dipteron* found in abundance during the latter days of April, 1888, at Biarritz in the south of France. The following is an abstract of Mr Deby's paper:

Psamthiomyia pectinata is a marine insect, living below water during its early existence, the larva feeding on *Enteromorpha*. The adult escapes from the pupal case while the descending tide has laid bare the algae covered rocks; these small insects swarm at such times, being especially active when the sun shines on them. The males are more numerous than the females, and are also much more rapid in their motions. . . . Both sexes have rudimentary wings, quite useless as organs of flight, so that these insects cannot possibly escape from the rising tide, which on this coast is accompanied by heavy surf and breakers. It is presumed that the life of the imago does not exceed the few hours during which the tide has receded. Several specimens which were immersed in a vial of sea water were immediately drowned. These insects being small have to be looked for with attention, but once discovered they are easily recognized; the black, very long-legged males look like minute spiders, while the dingy brown louse-like females, which they drag after them, have the appearance, from a distance, of the cocoons some spiders carry behind them.

Generic characters. Antennae (fig.6) six-jointed in both sexes, three middle joints submoniliform, neither feathered nor plumed, much shorter than the thorax and head; mesonotum (fig.9) cucullate, projecting over the head; legs very long and slender, especially in the males, the terminal joint of the tarsus being

furnished (along with the usual claws) with a special finger-like projection, extending over and between the claws, while a doubly curved curious comb-like appendage faces it from below (pl.35, fig.8).

Wings rudimentary (figs.4 and 5); much smaller in the females than in the males; wings without nervures. Halteres distinct (fig.7). The convex eyes are distant in both sexes but fartherest apart in the females. Both the claws on the end of the tarsi of the male are deeply cleft or bifid (fig.8), those of the female being simple. The comb-like appendages are similar in both sexes.

The external genitalia of the male consist of a powerful two-jointed pair of forceps, the lower joints of which are large, massive, subglobular, while the terminal joints are small and linear, and so articulated to the first as to curve inwardly between them when not in use. These terminal joints of the forceps carry at their tips an armature of short, sharp, scattered, horny spines. The ovipositor of the female is conical, narrowing towards the acute apex; it is constituted of two lateral plates or valves, which cover and protect two very delicate, parallel, acute, membranous spiculae.

Mr Deby further gives an extended description of the species, and a plate of eleven figures showing details of structure. The figures of the wings, the thorax, and the foot of the male are here reproduced on pl.35.

Of the remaining figures, that of the male forceps is like that of *Eretmoptera browni* Kellogg, shown in fig.24, pl.35, excepting that the basal joint of the latter is somewhat longer; and the legs of the male of *Psamathomyia* are shown as being proportionately longer than in the American species. Of the structural specific characters the following are of especial importance. The eyes are prominent and convex; the facets are large and hemispherical; the ocelli are absent. Each eye carries at its posterior lateral edge a black chitinous appendage of an oblong shape and of unknown use. The palpi are conspicuous, two-jointed, the terminal joint rich in sensory bristles. The empodium of both sexes is deeply fringed by a series of lengthened simple as well as forked or bifid teeth upon its outer edge, while its inner edge is quite smooth. The tergites of the

abdomen in both sexes number eight. Length of the male about 4 mm.; of the female 4.5 mm.

The larva. The larva of *Psamathomyia* is linear, vermiform, and of a yellow color. The apparent number of segments of the body, including the head, is twelve, one for the head, three for the thorax, and eight for the abdomen. The thoracic segments are shorter than the following; the apical one, into which the head is retractile, being the smallest. The thoracic anterior inferior angles of the somites carry inconspicuous minute bristly tubercles, while the abdominal segments, with the exception of the first and of the anal segment, are supplied in the same place with prominent rounded elevations or cushions which infringe on the anterior edge of the preceding segment. These appendages carry nine to ten parallel rows of very minute dark colored teeth, giving them the resemblance to microscopic currycombs. In front of each row of these teeth and standing at some distance one much stouter spine is visible. The anal segment terminates in five conical and somewhat incurved fleshy appendages, one of which is ventral and much larger and broader than the others. This appendage carries near its apex a large bunch of short-curved bristles, while those opposed to it bear several tufts of similar bristles, and the intermediate appendages are quite glabrous. The total length of this larva is 5.10 mm. The length of the anal segment, including its appendages, is .66 mm., that of the three thoracic segments .66 mm., while the middle segments of the abdomen measure .45 mm. in length by .90 mm. in width. The chitinous mandibles are distinctly visible; they appear, as far as can be made out, to be widely three-lobed or toothed, and to be in communication with two long internal chitinous rods, with slightly swollen heads, which terminate as far back as the last thoracic segment.

Pupa of the male. The pupa case, after the imago has escaped through a dorsal slit in the mesonotum, shows distinctly the three sternal divisions of the thorax, as well as the various segments of the abdomen. These are eight in number, unless the anal terminal process is considered as a segment, in which case the abdomen has nine segments. The sheaths of the legs are quite free, bag-shaped, distinctly jointed, rounded at the ends.

The hinder ones are convolute. The mesonotum shows a median transverse depression. The total length of the pupa is 4.5 mm.

Genus 14. *Clunio* Haliday

Natural History Review II, Proc. 62. 1855. (Pl.36, figs. 11, 12, 13)

Small ferruginous species, characterized by their one-jointed palpi and rudimentary proboscis.

The head is rounded and placed low; proboscis rudimentary, the palpi one-jointed. Antennae 11-jointed, the first two joints spherical, the third much elongated, the following rounded, scarcely hairy, the last joint quite long. Front broad at the vertex with a small protuberance; ocelli wanting or at least rudimentary; eyes round, somewhat hairy; mesonotum oval, overhanging the head, no transverse suture; scutellum semicircular; the metanotum moderately large. Abdomen shorter than the thorax, the segments crowded together, the last one broadened; the genitalia longer than the rest of the abdomen. Legs moderately long, anterior pair widely separated from the others; tibiae with a spur; the metatarsus elongated, the fourth joint smallest; claws and pulvilli well developed. Halteres leaf-like. Wings comparatively large, anal angle prominent. The venation of the type shown in the figure.

According to the Abbe Kieffer (1898 p.107, footnote), the figure of Haliday and here reproduced is not entirely complete. He says, "Le dessin de Haliday ne représente par la premiere ni la derniere nervure; en outre le rameau inferieur de là 4e fait un angle aigue avec le rameau superieur. . . ."

Of the female and of the life history the following is given by G. H. Carpenter (1894) p.129.

We discovered quite a colony of *Clunio marinus* Haliday on a mass of green sea-weed (*Cladophora*) covering a rock which had been left exposed by the tide. On some of the weed with the insects upon it being placed in a tube and examined, it became clear that we had now secured both sexes, for two of the males were carrying about with them (attached *in cop.*) wingless females. These when captured had their abdomens distended with eggs, and appeared of a dull greenish color. The female *Clunio* is much degraded (fig.13). Not only are the wings reduced to very small vestiges, but the legs are weaker,

and the antennae are shorter and of fewer joints (7) than are those of the male (whose antennae are 11-jointed). The male, by means of his strong claspers (so marked a character of the species), was able to hold the body of the female out in a straight line with his own, and thus carry her about; so that when he walked on the glass of the tube her legs could be seen kicking freely in the air.

During the next day each of the females laid about seventy eggs, enclosed like those of *Chironomus* in a gelatinous tube. The egg is narrowly spindle-shaped, and measures 0.16 mm. in length. By the morning of the second day egg-laying seemed to have finished, and the body of the mother became much shrivelled up. As in both sexes the mouth parts are vestigial, it is probable that life in the imaginal state is short.

Further examination of the *Cladophora* revealed a larva of the *Chironomid* type, which there can be little doubt is that of *Clunio* (fig.11). This larva (4 mm. long) is, excepting the head, which is brown, of a green color, closely agreeing with the sea-weed on which it feeds and lives. The head bears two deep black ocelli on each side (the posterior much larger than the anterior) and a pair of two-jointed antennae. The mandibles are powerful, armed with teeth, and articulated so as to move in almost vertical planes, though somewhat inclined inwards. They act, in conjunction with the serrated labial plate, as scissor-like cutters. There are twelve body segments, the first and last of which are each provided with a pair of sucker feet, the anterior pair armed with numerous spines, and the posterior with a few hooks. This larva has not the ribbon-like appendages and special breathing processes found in that of *Chironomus*. Chevrel (1894) states that the female has no halteres; that the labium of the larva has six or eight teeth, and that the last abdominal segment of larva has two long divergent setae. No North American species have been recorded.

GROUP TANYPUS

Tanypus Meigen. Illiger's Mag. 2:261. 1803

This group includes the genera *Procladius*, *Anatopynia*, *Abalabesmyia*, *Isoplastus*, *Tanypus* and probably also *Pentaneura*, *Podonomus*, and *Heptagyia*.

Eggs. The egg masses of the group *Tanypus* doubtless vary as much in form and manner of deposition as do those of *Chironomus*. The eggs of one species of *Tanypus* are described by Hammond (Postal Microscopical Journal) as circular gelatinous masses, adhering to floating objects. The eggs are arranged in double rows, along about eight straight and parallel lines which extend across the disk (pl.31, fig.11). I have caught female specimens of a species of *Tanypus* (*A. monilis*) while laying eggs and found still attached to the abdomen a string of eggs, resembling that of *Ceratopogon* (*Sphaeromyia*) *argentina*. From an examination of the dried egg strings it appears that in this species the eggs are arranged transversely, the egg string being about 1.5 inches in length.

Larva. All the species of this group agree, as far as I am aware, in having an elongate cylindrical body, a more or less elongate head, a somewhat enlarged thorax and distinctly marked abdominal segments, to the last of which are attached the legs. The head in some species is narrow and slender, over twice as long as wide, and in others less than 1.5 times as long as wide. The eye spots are situated on the sides of the head a little cephalad of the middle. The antennae are more or less elongate, in some species quite long and slender, in others short and stout, varying in length from less than 1.5 to over three times as long as the mandibles. The basal joint ranges from two-thirds to nine-tenths of the entire length; the second joint is usually slender, the third and fourth very minute. At the apex of the first joint (at the base of the second joint) is a slender process nearly or quite as long as the second joint. The antennae are retractile to about the apex of the long basal joint, extending back into sockets in the head. They are retracted by special muscles, and extended again by blood pressure. Meiner (1882) was the first to call attention to the retractile antennae of *Tanypus* larvae. The labrum is broad, truncate in front, smooth on the dorsal surface, the under surface delicately haired. In some species I have observed several pairs of very slender jointed appendages (pl.20, fig.6). I have discovered no part which is comparable to the epipharynx in *Chironomus*.

The mandibles are rather broad at the base, considerably curved and prolonged into a long apical tooth, the mesal teeth being short and sometimes indistinct or wanting. The maxilla consists of a broad, more or less square, fleshy process, with hairs or filaments projecting cephalad and mesad (pl.19, fig.1 *ma.*), and a prominent palpus (p) with a short basal joint. The palpus is provided with several papillae or apical processes.

The hypopharynx consists either of a horseshoe-shaped piece having a toothed margin (pl.20, figs. 1h and 6h), excepting the middle section, or of two curved pectinate pieces, their tips nearly touching each other; besides this there is a pointed slender lobe (figs.1x and 6x) on each side of the labium. The labium usually has five, though sometimes but four, marginal teeth, differing slightly in shape in the different species. The thorax is somewhat larger in diameter than the abdominal segments, and its three segments not so sharply separated. The anterior prolegs are quite long and slender. They have a long common base, and two branches, at the ends of which protrude the retractile claws. These claws are comparatively few in number, quite distinct, and not hair-like like those of *Chironomus*. The abdomen has nine segments and is in some species provided with lateral cilia. To the last segment of the abdomen are attached the abdominal legs and appendages (pl.19, fig.10). On the dorsal surface, and attached to the posterior margin of the ninth segment, are two moderately slender cylindrical processes, about three times as long as wide, each with a crown of six or eight long setae at the tip; between the posterior legs is a pair of pointed blood gills (b), and immediately dorsad of this pair is another pair. Often also there is a pair of long setae dorsad of the upper pair of blood gills. The anal feet are long and stilt-like, Degeer comparing them to wooden legs. The claws are slender, each usually with a basal tooth (pl.19, figs. 11 and 12), and are retractile. Blood worms are greedily devoured by *Tanyptus* larvae. The alimentary canal has a reddish tinge, which suggests that the larva preys upon the small red worms known as *Tubipex* or some other small creature which contains haemoglobin in its blood. Crustacea actually have been seen alive in the alimentary canal. The tracheal system is better developed than in *Chironomus*

larvae; but it does not appear to open to the surface. (Miall and Hammond, 1900.) *Tanyptus* larvae are said to make tubes like those of *Chironomus*, but in captivity they seldom seem to do so.

Pupa. Greatly resembles that of *Culex*, but differs in the form of the breathing trumpet, the form of the caudal fin, and in lacking the stellate hairs on the posterior margin of the thorax. It often remains below the surface but can come up to breathe. When alarmed it sinks and often holds on to objects at the bottom of the water by means of its tail. The pupa is further provided with suckers on the abdomen, which enables it to hold on to solid objects. Meinert (1886) says that the suckers are circular depressions outside the dorsal shields of the abdomen. The pupa of *Tanyptus varius* shows them most distinctly. Here they are borne in pairs by four abdominal segments (3-6). When the pupa has attached itself by a single sucker, it can turn about without losing its hold. The form of the pupa is shown on pl.19, fig.8. The thorax is large and bulky, the abdomen slender and curved under the thorax. The breathing trumpets vary in the different species (figs. 2, 3, 7, 13, and 18); in some species they are long, slender, cylindrical, and tube-like; in others spindle-shaped or funnel-shaped; and in one an elongate ellipsoid with a small aperture. The surface may be smooth, spinose, or reticulate. On the dorsum of the thorax back of the trumpets there is, in some species at least, a row of short spines (pl.19, fig.8). The wings, legs, antennae and eyes of the adult are distinctly visible in the more mature pupae. There are seven abdominal segments besides the anal to which the caudal fin is attached. There are no distinct spinose markings in the species which I have examined. The caudal fin varies with the different species; in some it is composed of two pointed projections, in others these are more lobe-like, while in an extreme form it is in the form of a rounded paddle (pl.19, figs. 4, 6, 15, 19, and pl.20, figs. 4 and 8).

The imago. Body elongate and pubescent. Eyes separate in both sexes. Palpi four-jointed, curved, first joint shorter than the second, second shorter than the third, fourth nearly as long as the second and third. Antennae in both sexes fifteen-jointed, filiform, seated in a notch in the eyes; plumose in the male, joints two to thirteen very small, fourteenth long, fifteenth short and

conical; in the female the antennae are pilose, the fifteenth thicker than the others, pubescent and more acuminate. Thorax elevated, with a depression in front of the scutellum, scutellum rather small; metathorax with a longitudinal furrow. Abdomen composed of eight segments, long, hairy; more hairy and longer in the male than in the female. Wings often pubescent, hairy along the hind border, the subcostal vein ending beyond the middle of the wing, vein R_1 ending about two thirds the length; vein R_{2+3} emerging from the crossvein and the lower branch (R_3) ending at beyond three fourths the length; vein R_{4+5} also proceeding from the crossvein, ending a very little in front of the tip; cubitus forked as usual, the M-Cu crossvein present. Legs long and slender, pubescent, unarmed; coxae of moderate size, claws very small; in the male the fore tarsi are often pilose, in the female always bare.

The group *Tanypus* which is equivalent to the genus of Meigen (1803) has been divided by Skuse (1889) into three genera, *Procladius*, *Isoplastus*, and *Tanypus* sens. str. Skuse proposed to retain the name *Tanypus* for those species in which the wings are hairy and in which the fork of the cubitus is proximad of the M-Cu crossvein. This cannot well be maintained since Meigen (1803) gives *cinctus* Fabr. (= *punctipennis* Meig.) as the type species, and it possesses hairy wings and the fork of the cubitus distad of this crossvein (i. e. petiolate). I therefore suggest retaining the name *Tanypus* for the last-mentioned division and propose the name of *Ablabesmyia* for the former. Skuse has already provided for the bare-winged species with the fork of the cubitus petiolate the name *Procladius*. *Isoplastus* applies to an Australian genus. There remain still the species having bare wings with fork of the cubitus proximad of crossvein, for which I propose the name of *Anatopynia*. These new genera will be more fully characterized farther on.

Genus 15. *Procladius* Skuse

Proc. Linn. Soc. N. S. W. 4:283. 1889

Tanypus Meigen, pt. 1803

Antennae in the male 15-jointed. Wings naked. R_2 and R_3 distinct. Fork of the cubitus short, its base lying midway between the M-Cu crossvein and the tip of its posterior branch

(pl.37, fig.12). In some species petiole of the cubitus is very short (pl.27, fig.4).

The only larva which I have found belonging to this genus is that of *adumbratus* n. sp. (pl.20, figs.1-5). Pupae of the above species and of *P. pinguis* Lw. will be found described upon a subsequent page (pl.19, figs.3-4, and pl.20, figs. 4 and 5).

KEY TO SPECIES OF PROCLADIUS

Imagines

- a* Legs uniform in color, pale or dark
 - b* Legs piceous or brownish; fore metatarsus about one sixth shorter than the tibia; opaque black species, thorax cinereous, black striped; crossvein lightly cinereous; wings white; halteres white; length 4.5 mm.1. *turpis* Zett.
 - bb* Legs yellow; brown species, prothorax, a spot near its humerus and scutellum dark yellow; length 4.5 mm. (Colorado)
 - 2. *occidentalis*
- aa* Legs bicolored
 - b* Yellow or red dorsum of thorax (usually pale species)
 - c* Scutellum and metanotum yellow, the latter sometimes with a line of black
 - d* Small yellowish species; thorax whitish with three shining red-dish stripes; length 1.5 to 2.25 mm.3. *pusillus*
 - dd* Larger yellow species, 3 mm.4. *bellus*
 - cc* Scutellum and metanotum, either one or both, with considerable black upon them
 - d* Tips of fore femora black; abdomen black and fuscous; male, length 4.5 mm.5. *thoracicus*
 - dd* Fore femora not as above
 - e* Fore femora wholly yellow; abdomen yellow; segments with black bases; female, length 3 mm.6. *concinus*
 - ce* Fore femora black and yellow
 - f* Femora black, bases yellow; male abdomen black and white; female abdomen black; male fore tibia white with black tip; female fore tibia black; length 3 mm. (Cuba)
 - 7. *humeralis*
 - ff* Femora and tibiae yellow, each with two black rings; abdomen black and yellow; female, length 3.5 mm.
 - 8. *tricolor*
 - bb* Black or fuscous dorsum of thorax (dark species)
 - c* Femora more than half yellow
 - d* Abdomen wholly dark brown subshining; thorax shining brown, with three shining dark brown stripes; tibiae nearly wholly brown; halteres sordidly yellow; female, length 3.5 to 4 mm.
 - 9. *caliginosus* n. sp.
 - dd* Each abdominal segment basally or apically yellow
 - e* Thorax pitchy black; pleura ferruginous; abdomen black; bases of segments yellow; male, 3 mm.10. *flavinctus*

cc Thorax and pleura with three wide dull dark brown or black stripes; abdomen brown, each segment with a yellowish posterior margin; length 2.5 mm.; female

11. *adumbratus* n. sp.

cc Fore femur black, excepting the immediate base

d Middle femora yellow; abdomen shining black; female, length 3.3 mm.....12. *pinguis*

dd All femora black with white bases; thorax black; pleura with upper half white; female abdomen black; male abdomen white and black.....13. *scapularis*

1. *Tanypus* (*Procladius*?) *turpis* Zetterstedt

1838 *Chironomus* Zett. Ins. Lapon. 811

1850 *Tanypus* Zett. Dipt. Scand. IX. 3596

Dusky cinereous, opaque, dorsum of thorax with three black stripes; antennae brown; wings and halteres white, the crossvein fuscous; legs brown; the fore tarsus of the male short pubescent, its metatarsus about one sixth shorter than the tibia. Length of male 5 mm; female 4 mm.

Male and female. Head dark. Antennae of the male brown, paler at the tip; that of the female yellow with a brown apex. Thorax cinereous, with three rather wide blackish stripes, the median one abbreviated posteriorly and continued by a fine dark line to the cinereous scutellum; metathorax blackish.

Abdomen black, that of the male slender, pilose, the last three segments with little wider pale margins, the caudal appendages small, slender, and incurved; in the female the abdomen is a little stouter and pubescent. Wings white, bare, the anterior veins subtestaceous, the remaining veins slender and white, the oblique R-M crossvein subfuscous; the perpendicular M-Cu crossvein is slender and spotless. Legs rather slender, wholly brown or pale, slightly pubescent. Fore tarsus a little shorter than the tibia, the second tarsal joint one half as long as the metatarsus, the remaining joints gradually decreasing in length. (This species may possibly belong to the genus *Anatopynia*.) Greenland, New Jersey (Johnson, 1904).

2. *Procladius occidentalis* Coquillett

1902 *Tanypus* Coq. Proc. Nat. Museum. 25:92

Brown, the prothorax, a spot near each humerus, and the scutellum dark yellow, legs light yellow, halteres whitish; hairs of antennae brown and yellow, wings hyaline, bare, first vein not connected with the second by a crossvein (i. e. R_2 and R_3 coalescent); fifth vein (cubitus) forks a short distance beyond the crossvein, the latter situated nearly its length before the small crossvein; length 4.5 mm. A male specimen. Colorado, New Jersey (Johnson, 1904).

3. *Procladius pusillus* Loew

1866 *Tanytus* Lw. Berl. Ent. Zeit. 4

Male and female. Very pale yellow, the thoracic stripes and the metanotum ochreous red, each abdominal segment with a fuscous basal fascia, wanting or indistinct in the female, the legs white, the extreme tips of the tibiae and the apical ends of the tarsi black, the fourth tarsal joint simple, wings bare, subhyaline, the crossvein subfuscous. Length 1.5 to 2.3 mm. Wing 1.5 to 1.8 mm. Much resembles *T. bellus*, but is paler and smaller.

The head is pale, the disk of the occiput red, antennae fuscous, in the female with pale base; in the male the hairs subfuscous. Thorax pale yellow, with three red stripes, the median one posteriorly much abbreviated and often divided by a fine line, lateral ones much abbreviated anteriorly. Metanotum and the upper half of the pleura red; the pleura are sometimes wholly red. Scutellum yellowish. Abdomen of the male whitish, each segment with a fuscous basal ring; the abdomen of the female is sometimes wholly white or pale yellow, sometimes with lateral subfuscous spots, rarely each segment with a subfuscous ring. The legs are white, short pilose, extreme tips of tibiae black, the tarsi marked like *P. bellus*. Halteres white. Wings bare, subhyaline transverse vein subfuscous or fuscous. Washington D. C. (Pl. 27, fig. 1).

To the above description may be added that the tips of two or three joints of the tarsi are blackish, the fourth and fifth tarsal joints infuscated. Fore metatarsus about one-third shorter than its tibia. Specimens from Ithaca, N. Y. Michigan.

4. *Procladius bellus* Loew

1866 *Tanytus* Lw. Berl. Ent. Zeit. 4

Male and female. Pallidly yellow, the thoracic stripes and the metanotum reddish, pleura and pectus red and fuscous variegated, the abdomen black annulate, the tarsi towards the tip, and the extreme tips of the tibiae black, the next to the last tarsal joint normal, the wings bare, subhyaline, the transverse veins fuscous. Length 2.7 to 3 mm. Wings 2.5 to 2.7 mm.

The head pale or dilutely clay yellow, the disk of the occiput ferruginous, the antennae of the female pallid, blackish towards the tip, that of the male subfuscous, with basal and apical joints black, with pale pile. Dorsum of thorax pallidly yellow, with three reddish stripes, the median one much abbreviated posteriorly and divided by a very slender pale line; the lateral stripes much abbreviated anteriorly. Scutellum pallidly yellow. Metanotum reddish or ferruginous, often marked with a fuscous

median line. Pleura variegated reddish and fuscous. Abdomen pallid, each segment with a black or fuscous basal fascia, wider on the more posterior segments. The legs covered with whitish or pale yellow pile; the extreme tips of the tibiae are black; the first pair of tarsi are black from the tip of the metatarsus onwards, the base, however, of the second joint in the male being pallid; the second and third pairs have pale first and second joints excepting the extreme tips; the remaining joints are black, though in the male the base of the third joint is pale. The fourth tarsal joints are all simple and sublinear. Halteres white. Wings bare, subhyaline, crossveins fuscous or black. Washington D. C. (Loew.) Fork of cubitus petiolate. (S. Henshaw, in litt.)

5. *Procladius thoracicus* Loew.

1866 *Tanypus* Lw. Berl. Ent. Zeit. 4

Male. Reddish, shining, flagellum of the antenna, scutellum, and abdomen, excepting the base of each segment, black fuscous, the legs yellowish, the tip of each tibia and each tarsus, excepting the base, black, the fourth joint of the latter short, that of the middle and hind pairs obcordate, the wings bare, subhyaline, the crossveins fuscous. Length 4.5 mm. Wing 3 mm.

Head yellowish red, the first joint of the antenna the same color or dusky red, the flagellum and its hairs fuscous. Thorax reddish, shining, the color of the humeri verging upon yellow, the scutellum blackish fuscous, the metanotum reddish or subfuscous. Each segment of the abdomen with fuscous black unevenly distributed, so that often they are wholly black excepting the basal joints. The legs are pale yellow, the extreme tips of the fore femora and of all the tibiae are black, the fore tarsi have the last four joints and the apical third of the first joint black; the middle and hind tarsi from the tip of the second joint are black; all the fourth tarsal joints are short, those of the second and third pair of legs are obcordate. Halteres white. Wings bare, subhyaline, crossveins fuscous. Washington, D. C. (Loew.) Fork of cubitus petiolate. (S. Henshaw, in litt.)

6. *Procladius concinnus* Coquillett

1895 *Tanypus* Coq. Proc. Acad. Nat. Sc. Phil. 308

Light yellow, three vittae on the thorax reddish yellow, the middle one bordered each side with black, the lateral ones changing into black posteriorly; a dot at each front angle of the scutellum, middle of metanotum, a fascia at base of each abdominal segment except the first, apices of tibiae, of metatarsi, of the second joint of middle and hind tarsi, the whole of the remaining joints and the last four of the front tarsi black.

Penultimate joint of hind tarsi obcordate, as broad as long. Wings naked, whitish hyaline, veins pale yellowish, small crossvein clouded with brown, first vein forked before its apex, the fifth (cubitus) forking slightly beyond the crossvein. Length 3 mm. Female. Tick Island, Florida.

7. *Procladius humeralis* Loew

1866 *Tanypus* Lw. Berl. Ent. Zeit. 3

Male and female. Reddish, the humeri and the upper half of the pleura white, the pectus and metanotum fuscous, the legs white and black variegated, the wings bare, with a central black spot which covers the crossveins, the penultimate tarsal joint short, obcordate.

Male. The abdomen white and black ringed, the fore tibiae white except the tip.

Female. The abdomen wholly black, the fore tibiae wholly black. Length 2.7 mm. to 3.3 mm. Wing 2.5 to 2.7 mm.

Head white, the disk of the occiput fuscous. The antennae fuscous, of which the flagellum of the male is paler. The thorax red, in the male opaque, in the female somewhat shining and often more deeply colored; the collar, humeri and upper half of the pleura in both sexes white, though the color is less pure in the female. The pectus and metanotum fuscous black. The abdomen of the male is black, but the first two segments, the tip of the third and fifth, and the fourth and sixth except the base, are white. All the femora in both sexes excepting the white bases are black or pitchy; the fore tibiae of the female are of the same color, those of the male are white with black tips; the middle tibiae of the female are usually black, rarely with a fuscous ring; those of the male are white with black tip and base; the hind tibiae except base and tip are white in both sexes; the fore tarsi are black, the first joint is white except the tip, in both sexes; in the male the base of the second is often lutescent; the first two joints of the middle and hind tarsi of both sexes are white, with black tips, the remaining joints being wholly black; all the fourth tarsal joints short, obcordate. The wings are bare, subhyaline, with a small black spot covering the crossveins and anastomosing with a minute spot on the cubitus. Cuba. (Loew.) Fork of cubitus sessile. (S. Henshaw, in litt.) May possibly belong to *Anatopynia*.

8. *Procladius tricolor* Loew

1861 *Tanypus* Lw. Berl. Ent. Zeit. 309

Female. Yellowish, the thorax with reddish ferruginous stripes, fuscous marginate, the abdominal segments with black bases and yellow posterior margins; the legs black-ringed; the wings hya-

line, bare, the longitudinal veins pale, the crossveins fuscous black and fuscous bordered. Length 3.5 mm. Wing 3.75 mm.

The head is very pale yellow. The palpi fuscous. The antennae are short, fuscous, with the scapus (basal joints) pale yellow. The humeral spots of the thorax and the pleura are pale yellow; the dorsal stripes are confluent, reddish ferruginous, and fuscous marginate. The scutellum is fuscous, with a yellow median line. The metanotum is fuscous black; the pectus ferruginous. The first segment of the abdomen is wholly yellow, the second is yellow with a fuscous base; the remaining segments are black, each with a yellow posterior margin. The legs are yellow, black annulate; the median ring of the femur is wide but somewhat faint, the apical ring narrower and distinct; the tibial rings are distinct, the sub-basal one wide, the apical one narrow. The fore tarsus from the tip of the first joint is black, the middle and hind tarsi each have the tip of the first joint and all the following joints black. Halteres pale yellow. Wings hyaline, bare, the longitudinal veins are yellowish, the crossveins are fuscous black with a fuscous border. New York. (Loew.) Fork of cubitus sessile. (S. Henshaw, in litt.) May possibly belong to *Anatopynia*.

9. *Procladius caliginosus* new species

(Pl. 27, fig. 2)

Female. Dark brown, somewhat shining, with robust body. Wings bare, slightly smoky, crossvein clouded. Length 3.5 to 4 mm.

Resembles *P. pinguis* Loew, differs from it in having the antennae wholly fuscous, and in having the tibiae nearly wholly brown. The head, mouth parts and antennae wholly fuscous, vertex, shining. Dorsum of thorax shining brown, with three shining dark brown stripes, the middle one divided. Scutellum and metanotum shining dark brown. Pleura pale brown, sternum darker brown. Abdomen wholly dark brown, subshining. Coxae pale, trochanters and femora yellow, the apical one third of the first pair of the femora and the apical one fourth or one fifth of the second and the third pairs brown; tibiae brown, the middle section of the middle pair slightly paler, the hind pair with a broad yellowish band beyond the middle. Tarsi brown, the basal two thirds of middle and hind metatarsi yellowish. Fourth tarsal joints obcordate. Wings slightly smoky, particularly along the course of the veins; anterior veins brown, crossvein clouded with brown. R_2 present, crossvein like, near the tip of R_1 . The cubitus forks a little beyond the M-Cu crossvein. Halteres sordidly yellow. Fore metatarsus about 0.6 as long as its tibia. Several specimens, Ithaca, N. Y.

10. *Procladius flavicinctus* Loew

1861 *Tanypus* Lw. Berl. Ent. Zeit. p.309

Male. Pitchy black, shining; the base of each segment of the abdomen yellow; the wings hyaline, bare, the heavier veins fuscous; halteres white; legs yellow, the tips of the fore and hind tibiae and the apical half of all the tarsi black. Length 3 mm. Wing 2.7 mm.

Shining pitchy black. Palpi yellow; face yellow; antennae dark fuscous, its hairs of the same color. Pleura ferruginous. The base of each of the abdominal segments is yellow, the yellow of the anterior ones wide and entire, that of the posterior ones narrow and interrupted. The claspers are obtuse, equalling the seventh segment in length. The legs are yellow, the tips of the fore tibiae widely, the hind tibiae narrowly, black-ringed, the fore tarsi from the tip of the first joint, the middle and hind tarsi from the tip of the second joint onwards are black. The wings are bare, hyaline, very faintly cinereous, the more delicate veins testaceous, the heavier ones fuscous. Pennsylvania. (Loew.) Fork of cubitus petiolate. (S. Henshaw, in litt.)

11. *Procladius adumbratus* n. sp.

(Pl.20, figs. 1-5)

The larvae were collected in July and October in Eddy Pond, Ithaca N. Y. The larva is a buff yellow, mottled more or less with brownish spots. Length about 5 mm.

Head short, about one and one-half times as long as wide, brownish, antenna about one-fourth longer than the mandible, its basal joint more than three-fourths the entire length. The eye spots black, simple. Mandible rather slender, apical tooth sharp, black tipped; the lateral teeth small and indistinct. Maxilla large, with a prominent stout palpus. Hypopharynx composed of a pair of curved pectinate chitinous branches apparently connected in the center by membrane (fig.1, h). Labium (l) with five teeth, the laterals a little longer than the median. The lateral margins of the abdomen fringed with long but very delicate pale hairs. Anterior legs with numerous, short, curved, but not pectinate claws. The posterior claws are of two kinds, the centrals long and slender (fig.2), and the marginals short and flattened (fig.3); all of the same brownish color. The dorso-anal papillae are long and slender, each with ten long brownish setae. The four anal blood gills are pointed and slender, but not as long as the anal prolegs.

The pupa is brownish; length about 3 mm. Respiratory trumpets slender (fig.5), about as long as one of the abdominal

segments, the surface with minute, pointed, chitinous scale-like projections. Body smooth and hairless; the abdominal segments under the highest magnification minutely punctate; the lateral margins of the last two segments with four or five pale, slender filaments. The caudal fin (fig.4) with rounded paddle, and with small, short, marginal setae.

The imago, female. Head, including front, vertex, back of head, orbit, and basal antennal joint, yellowish. The second antennal joint and a triangular spot on vertex polished black; the remaining antennal joints, the dorsal surface of proboscis and palpi deep fuscous. Thorax, including pleura and pectus, yellowish like the head, the last sometimes blackish; the dorsum with three dark brown or black longitudinal stripes, the middle one divided; scutellum and metanotum blackish. Abdomen fuscous, each segment with a wide dusky yellow, posterior margin; venter dusky yellow, the hair of scutellum and the first abdominal segment stiff and black, the remaining abdominal segments with yellowish hairs. Legs yellowish, the tips of the tibiae and of the metatarsi, and the whole of the remaining tarsal joints subfuscous or blackish. Fore metatarsus about two thirds as long as its tibia. Fourth tarsal joint obcordate.

Wings subhyaline, hairless, the radial veins yellow, the basal part of the media and cubitus as far as the crossveins dusky, the latter also darkened; the other veins pale; R_2 present, near the apex of R_1 ; the cubitus forks far distad of the crossveins. Halteres pale yellow. Length $2\frac{1}{2}$ mm. Ithaca N.Y.

12. *Procladius pinguis* Loew

1861 Tanyptus Lw. Berl. Ent. Zeit. p.308

(Pl.27, fig.3; pl.19, figs. 3 and 4)

The larva is of a reddish color of almost as deep a shade as a *Chironomus* larva. The single larval skin was lost. The pupa is fuscous; its respiratory trumpets are white, comparatively large, with the free end open and larger in diameter than at any other point. The surface quite smooth. The abdomen is nearly devoid of setae, excepting the margin of the last two segments, which are as shown in fig.4, pl.19; each with about five filaments on each side. The caudal fin is nearly circular in outline with a V-shaped notch at the apex, margin ciliate.

The imago, female. Black, shining; wings cinereous hyaline, bare, the heavier veins dark fuscous; halteres white; first pair of legs pitchy black, bases of femora yellow; middle and hind legs

yellow, the extreme tips of the tibiae and the apical half of each tarsus black. Length 3.3 mm. Wing, 3.4 mm.

The species resembles *T. nervosus* (European), but the yellow base of the antennae and the white halteres distinguish it with certainty. Shining pitchy black, palpi fuscous; face and front sordidly ferruginous; antennae fuscous, the scapus and the basal joints of the flagellum yellow. Pleura ferruginous; pectus yellow. The fore legs pitchy black, the coxae and basal third of each femur yellow; the middle legs yellow, the bases of their tibiae infuscated, the tips of the tibiae and the part of the tarsus from the tip of the metatarsus fuscous black; the hind legs yellow, the tip of tibia and the part of tarsus beyond the tip of the second joint fuscous black. Halteres yellowish white. Wings cinereous hyaline, bare, the more delicate veins pale fuscous, the heavier ones dark fuscous. New York.

To the above description may be added that in a newly emerged specimen the dorsum of the thorax is distinctly striped, with the space between the stripes yellowish. The fourth tarsal joint is longer than the fifth, and but little broadened. Legs sparsely haired. Fore tibia about twice as long as its metatarsus. Wing venation as figured. One bred specimen. Ithaca, N. Y.

13. *Procladius scapularis* Loew

1866 *Tanytus* Lw. Berl. Ent. Zeit. p.2

(Pl.27, fig.4)

Male. The abdomen white and black annulate, the fore tibiae and the fore metatarsi white excepting their tips.

Female. Abdomen wholly black, the fore legs excepting the bases of the femora black. Length 3 to 3.7 mm. Wings, 2.5 to 2.7 mm.

Male and female. Black, the humeri and the upper half of the pleura white, the legs white and black variegated, the wings bare, with a central black spot covering the crossveins, the fourth tarsal joint short, obcordate.

Head white, the disk of the occiput pitchy black; antennae of the female short, fuscous; of the male antennae the first joint is black, the flagellum subfuscous. The thorax of the male is black and opaque, that of the female is pitchy black and subshiny; the humeri, the collar, and the upper half of the pleura white in both sexes. Scutellum same color as the thorax. Abdomen of the male black, excepting the whole of the first two segments, the posterior margin of the third, the posterior four-fifths of the fourth, and the posterior one-half of the sixth, which are

white; the abdomen of the female is wholly black. All the femora excepting their white bases are black, or pitchy black in both sexes; the tibiae and fore tarsi of the female are the same color; those of the male are white, but the tips of the tibiae and the tarsi from the end of the first joint are black. The middle and hind tibiae are white, the base and tip widely black; the middle and hind tarsi black, the first joint except its tip white; all the fourth tarsal joints of both sexes short, obcordate. Halteres whitish. Wings bare, subhyaline, with a small black spot, which covers the crossvein and anastomoses with a small spot (also black) on the cubitus. The female differs in having black middle tibiae each with a white ring. Washington, D. C.

A male and a female specimen, the first from New Jersey, the second from Washington, D. C., in my possession agree perfectly with the above description. It may be added that the basal two-thirds of the antennae and its hairs are pale fuscous, the apical one-third darker.

Genus 16. *Anatopynia*, new genus

Tanypus Meigen. Illiger's Mag. 1803 (pt.)

Belongs to the group *Tanypus*. Antennae fifteen-jointed in both sexes; wings bare; R_2 usually present near the tip of R_3 ; fork of the cubitus slightly proximad of the M-Cu. crossvein. Type of the genus *T. plumipes* Fries (1823).

To this genus probably belong also the following European species: *forcipatus* Egger (1863); *nudipes* Zett. (1850); *consobrinus* Zett.; *lactipennis* Zett.; *morio* Zett.; *pubitarsis* Zett. The species *tricolor* Lw. (N. Y.), *humeralis* Lw. (Cuba) and *turpis* Zett. (Greenland) may possibly belong in this genus. See descriptions on p. 127, 130. Of this group Meinert (1886) has figured the respiratory organ of the pupa of *plumipes*.

Genus 17. *Ablabesmyia*, new genus

Tanypus Meigen. 1803 (pt.); *Tanypus* Skuse. 1889

Antennae 15-jointed (counting basal joint); wings hairy, the cubitus forks at or before the M-Cu. crossvein.

For this subdivision Skuse (1889) had proposed to retain the name *Tanypus* Meigen, but this cannot be maintained for the reasons given on p. 125.

KEY TO SPECIES OF ABLABESMYIA

Larvae

- a* Labium with but four teeth, pl.19, fig.5...25. Species from Ithaca, N. Y.
- aa* Labium with five teeth
 - b* Several claws of the posterior feet stouter and conspicuously darker colored than the others, pl.19, fig.14. Antennae over three times as long as the mandibles.....6. *monilis*
 - bb* Claws of posterior feet all the same color
 - c* Antennae rather short and stout (pl.20, fig.1) less than 1.5 times as long as the mandible; sides of abdomen fringed laterally with hairs.....*Procladius adumbratus* (q. v.)
 - cc* Antennae over twice as long as the mandibles
 - d* Teeth of labium of about equal length; antennae three times as long as the mandible, pl.20, fig.6.....4. *carnea*
 - dd* Not as above
 - c* Mandible stout at base with distinct tooth near apex; basal joint of antenna about two thirds of total length, pl.19, figs. 16 and 17.....22. *fastuosa* n. sp.
 - cc* Antenna with its basal joint over three fourths the total length, pl.19, fig.1.....16. *flavifrons* n. sp.

Pupae

- a* Swimming paddle rounded, not sharply notched at apex
 - b* Trumpet rather elongate, over four times as long as wide; swimming paddle as shown in pl.20, fig.4
Procladius adumbratus (q. v.)
 - bb* Trumpet short (pl.19, fig.3); swimming paddle as shown on pl.19, fig.1.....*Procladius pinguis* (q. v.)
- aa* Swimming paddle with two pointed lobes
 - b* Thoracic respiratory organ (trumpet) egg-shaped, with very small aperture, pl.19, fig.13.....6. *monilis*
 - bb* Breathing organ funnel or club-shaped
 - c* Breathing organ club-shaped, pl.19, fig.2..16. *flavifrons* n. sp.
 - cc* Breathing organ not of this type
 - d* Swimming paddle rather broad, but little longer than wide, pl.19, fig.6. Trumpet as shown in fig.7.....10. *dyari*
 - dd* Swimming paddles quite pointed
 - c* Paddle and breathing trumpet as shown on pl.19, figs. 18 and 19.....22. *fastuosa*
 - cc* As shown on pl.20, figs. 7 and 8.....4. *carnea*

Imagines

- a* Wings clouded (banded or spotted)
- b* Legs nearly uniform in color
 - c* Wings uniformly spotted with fuscous; fuscous species; the thorax with three dusky stripes; legs yellow; length 4.5 mm.; female. (= ? *decedens* Walk.).....1. *pictipennis*
 - cc* Smaller paler species; the wings with few large bars or spots
 - d* The first fascia of the wing lies distad of the crossvein; length $2\frac{1}{2}$ to 4 mm.....2. *bifasciata*

- dd* The fascia lies proximad or over the crossvein
 - c* The abdominal segments of the male each have brown posterior margins; head brown. 3 mm.3. *futilis*
 - ee* The abdominal segments of the male have brownish fasciae or spots near *anterior* margin of each; the female has a brownish abdomen with paler posterior margins to the segments
 - f* Three to five mm. in length; pale yellowish; abdominal fasciae of the male pale brown; dorsal stripes reddish or brown4. *carnea*
 - ff* Two and one half mm. or less in length; thorax brownish; dividing lines cinerous.4a. var. a. *carnea*
- bb* Legs distinctly bicolored
 - c* Wings spotted but not banded
 - d* Species with brown or black thorax and abdomen, pl.37, fig.17 (Greenland)5. *pulchripennis*
 - dd* Pale (reddish or yellowish) species
 - c* Tibia with three rings; femur with one at the tip (=annulatus Say)6. *monilis*
 - ee* Tibia not with three rings
 - f* Femur with two brownish rings near the apex; wing with about eleven brown spots (California and New Mexico)7. *venusta*
 - ff* Femur with one ring
 - g* Abdomen of male pale yellow, black and brown fasciate; wing with apex from slightly before tip of R_1 , grayish brown and containing several whitish hyaline drops; length 5 mm. (Washington)8. *guttularis*
 - gg* Abdomen brownish fasciate; wing with apical half with many mostly isolated brown spots; length 3 to 4 mm. (New Mexico)9. *barberi*
 - cc* Wing with one or more cross bands
 - d* Femora and sometimes tibiae also with brown bands
 - c* Wing with median band and apical third of wing brownish, marked with several hyaline spots; each femur with subapical ring, tibia with basal ring; length 3 to 4 mm.10. *dyari*
 - ee* Apex of wing with band or spot, but no hyaline spots in it
 - f* Wings yellow, humeral crossvein brown clouded, brown fascia across wing and at apex of vein R_1 , each femur with apical and tibia with basal band; tarsi white, apical joint brown; length 3 to 3.5 mm. (New Jersey)11. *johnseni*
 - ff* A pale brown cloud near the tip of the wing also; length 3 to 5 mm.12. *ornata*
 - dd* Femora and tibiae not banded, or with only apices of femora and either bases or apices of tibiae slightly darkened
 - c* Wing with one faint brown band. Yellow species with three thoracic stripes, metanotum, spots on pleura and sternum, brownish black; apices of femora and bases of tibiae brownish; length 3 mm.; female (Alaska)13. *algens*

- cc Wing with two cross bands and the apex largely brown, these bands containing hyaline spots; apices of femora and tibiae slightly darkened; length 3 mm. (New Hampshire) (compare *dyari*).....14. *discolor*
- aa Wings not clouded excepting sometimes the crossvein or a faint smokiness near the apical end
- b Pale species
- c Species over 3 mm. in length
- d Wholly yellowish species.....15. *melanops*
- dd Abdomen, at least of the male, with brown fasciae
- e Thoracic stripes, metanotum, and sternum brown.....16. *flavifrons* n. sp.
- cc Thoracic stripes, etc., yellow.....24. *nigropunctata*
- cc Species less than 2.5 mm. in length
- d Thorax not striped; pale yellow species
- e Length 1.5 to 2 mm., front metatarsus nearly as long as its tibia; (St Vincent Island).....17. *flaveola*
- cc Length 1 mm., basal cells of wing short (D. C.).....20. *pilosella*
- dd Thorax with longitudinal stripes
- c Abdomen pale yellow; the male with segments two to five with a band near the base and nearly the whole of the following segments pale brownish; mouth parts brown; R_2 present near the tip of R_1 ; length 1.25 to 2.5 mm. (New Mexico). (A variety with yellow mouth parts from New York.).....18. *pallens*
- cc Not as above; basal cells of wing short
- f Species 1.5 to 2.25 mm. long; abdomen brown with ashy posterior margins to the segments; crossvein proximad of the basal third of the wing (New York and St Vincent Island).....19. *indecisa*
- ff Species 1 mm. in length (Washington, D. C.).....20. *pilosella*
- bb Darker species
- c Halteres pale fuscous; blackish; legs sordidly yellowish brown; tibiae long-haired; thorax dark; abdomen somewhat shining and fuscous haired; the R-M crossvein near the middle of the wing; length 2.5 mm. (Greenland).....21. *tibialis* Staeger
- cc Not as above
- d Length 3 mm.; metatarsus about 0.6 as long as the tibia; halteres white.....22. *fastuosa* n. sp.
- dd Length 3.5 to 4 mm.; halteres luteous.....23. *hirtipennis*

1. *Ablabesmyia pictipennis* Zetterstedt

1838 *Tanypus* Zett. Ins. Lapon. 818. (= ? *T. decedens* Walker)

1878 *Tanypus* O. S. Catl. Dipt. 22

Female. Fuscous black, pilose; the thorax with three dusky stripes; the wings white, uniformly sprinkled with fuscous clouds; the halteres white; the legs yellow. Length 4.5 mm. This species

resembles *T. nebulosus* (an European species) but is a little smaller, the abdomen is not annulate, the incisures only being narrowly pallid, and the wings are white, uniformly fuscous spotted, hairy. Greenland. (Staeger and Lundbeck.)

T. nebulosus mentioned above is a grayish brown fly about 7 mm. long, with striped thorax and banded abdomen; legs reddish yellow, the tibiae with dark tips and the tarsi dusky; wings hairy, clouded; the fork of the cubitus sessile.

The description of *Tanypus decedens* Walker p.22. (1848) is as follows: This species resembles *T. nebulosus* Meigen, but the spots of the wings are much fainter and the tips of the thighs and of the shanks are not dark. Length of the body, 4 mm. Of the wings 10 mm. St. Martin's Falls, Albany River, Hudson Bay Ter.

2. *Ablabesmyia bifasciata* Coquillett

1901 *Tanypus* Coq. Proc. U. S. Nat. Mus. 23:609

Male. Differs from *johnsoni* (see number 11) as follows: Front corners of scutellum brown, apical joint of tarsi white, no brown band on femora, nor on tibiae, brown of abdomen confined to a fascia at base of segments 2 to 6 and middle of dorsum of seventh, (front tarsi wanting), hairs of wings chiefly brown, humeral crossvein not bordered with brown, the first fascia lies beyond the small crossvein; length, 4 mm.

Female. Hairs of antennae whitish, abdomen yellow, destitute of brown markings, otherwise as in the male. Length 2.5 mm. A specimen of each sex.

Habitat. Riverton, N. J. (C. W. Johnson); Pennsylvania; and Boston, Mass.

3. *Ablabesmyia futilis* Van der Wulp

1868 *Tanypus* Wulp. Tijd. v. Ent. ser.2. 2 (X), 130

Fuscous; the abdomen white and fuscous annulate; scutellum, legs and halteres pale yellow; wings pilose, clouded and spotted; fork of the cubitus sessile. Male; length, 3mm.

Male. The head is dark brown, on the eye margins with a paler sheen; proboscis and palpi brown; antennae with its hairs yellowish brown. The thorax moderately arched, dark brown, the anterior margin, the humeri, and a pair of longitudinal stripes upon the dorsum with a whitish sheen; scutellum whitish yellow; metanotum blackish. Abdomen transparent whitish, with a broad brown posterior margin on each segment and a blackish brown interrupted longitudinal dorsal stripe; the last segment wholly darkened, somewhat flattened, the last two segments a little broad-

ened; the claspers brownish yellow, as long as the last segment; the hair of the abdomen pale yellow or light brown, very dense and long. Legs unicolorous, pale brownish yellow; the coxae alone somewhat darker; the fore tarsi not hairy; the fore metatarsus about one fourth shorter than the tibia; the fore femora upon the flexor surface, as also the whole of the hind legs with a moderately long, delicate, yellowish hair. Halteres pale yellow or whitish. Wings hairy, hence grayish, clouded and spotted; the most conspicuous spot covers the crossveins, another spot nearer the wing tip between the radius and media, another below the crossvein not far from the posterior margin; the humeral crossvein is black; the media is bent downwards a little just before its ending at the wing tip; the fork of the cubitus begins at the M-Cu crossvein and is therefore sessile. Translation from the Dutch of V. d. Wulp. Wisconsin.

4. *Ablabesmyia carnea* Fabricius

1805 *Chironomus* Fabr. Syst. Ant. 41, 16

1818 *Tanypus* Meigen. Syst. Besch. 1:67, 21

1850 *Tanypus* Zetterstedt. Dipt. Scand. 9:3620

1864 *Tanypus* Schiner. Fauna Austriaca. 2:620

1877 *Tanypus* V. d. Wulp. Dipt. Neerlandica. p.304

1823 *Tanypus albipes* Fries. Monogr. Tanyp. Suec. 16, 11

(Pl.20, figs. 6, 7, 8)

Larva. Larvae from Ithaca, N. Y. Reddish yellow. Head about three times as long as wide, the antennae slender, three times as long as the mandible, the first joint three-fourths of the total length. The labrum smooth above, hairy beneath, with two short and two more elongate, very slender-jointed papillae. Mandibles slender, apical tooth black tipped, elongate, lateral teeth small and irregular. Maxilla with a stout cylindrical palpus, having a crown of 5 or 6 apparently jointed terminal joints. The marginal teeth of the labium are rounded, of equal size and five in number; those of the hypopharynx are minute, rounded and also of equal size (fig.6, h). The body has a very few scattered minute setae. Caudal appendages as shown in pl.19, fig.10. The claws of the posterior legs are very slender, and the slender, central ones apparently without a basal prominence. Anterior claws quite numerous and slender, not pectinate.

Pupa. Yellowish; length 4 mm. Respiratory trumpet cucumber shaped with basal end somewhat curved and tapering (pl.20, fig.7); near the base of each is an arcuate transverse line of short, pale, blunt tubercles. Abdominal segments nearly devoid of setae. The caudal fin (pl.20, fig.8) consists of two pointed

processes, each with a pair of pale, slender filaments, and on the lateral margin of each of the last two segments are four or five of such filaments.

Imago. Male and female. Pale yellow, wings marked, legs pale yellow. Length 3 to 5 mm.

Male. Head pale yellow, including basal joint of the antenna. Antennae yellowish brown, eyes black, palpi and apex of the proboscis fuscous. Thorax pale yellow with three wide buff-colored stripes; or it may be said that the dorsum of the thorax is buff-colored, having three fine whitish lines, upon each of which there is a close row of pale hairs. In some lights the anterior part of the thorax, a space in front of the scutellum and the scutellum have a whitish sheen. Pleura, metanotum and sternum are yellow or buff-colored, the first has 3 brownish bars or spots; the last has its sides brownish. The abdomen is pale yellow; near the anterior margin of each segment is a transverse row of brown spots; these are sometimes confluent and thus form bands; the last two or three segments are more brownish. Genitalia conspicuous, pale yellow. The hairs on abdomen and genitalia pale. Legs, including coxae, cream-white, the hairs pale, apex of each tibia with a very minute black comb with one tooth prolonged into a spur. Fore metatarsus more than three-fourths as long as its tibia. Wings hairy; a brown cloud covering the crossveins, a larger paler cloud at the tip of R_1 extending nearly across the wing, but very faintly beyond the media; a third faint cloud at the apex of Cu_2 extending to the media; a fourth very faint one in the anal cell. Veins pale, except the crossveins which appear dark. Some of the spots on the wing in some specimens coalesce so their wings may be said to have two cross bands. Halteres white.

Female. Differs from the male in having pale yellow antennae; palpi sometimes pale, abdomen yellow, the posterior margin of the segments with a whitish sheen. The wings are broader.

Var. a. female. Differs from the above in having the anterior end of all three dorsal stripes tipped with dark brown, and two small dark brown spots on the middle of the median stripe. Metanotum with a white central line, pleura with three brown dashes, two vertical and one horizontal. Several specimens. Ithaca N. Y.

Var. b. female. Differs from a typical specimen in having a deeper yellow thorax, brownish stripes, yellowish brown metathorax, pleura and sternum yellowish brown or brownish. Abdominal segments with indistinct yellowish posterior margins. Legs yellow, last two tarsal joints infuscated. Several specimens. Ithaca N. Y.

Var. c. male. Yellowish brown; length 2 to 2.5 mm. Thorax, including pleura, sternum, and metanotum reddish brown, scutellum and humeri yellow, dorsum of thorax with three indistinct longitudinal stripes darker brown. By oblique light it appears as if there were four dark brown stripes and five narrow whitish ones. Abdomen yellowish white, with the anterior margin of each segment blackish, this color produced backward on the dorsal and ventral surface in a fine line, forming broken longitudinal stripes. Posterior segments and the genitalia more brownish.

Female like the male, but the abdomen is brown, with slightly paler posterior margins. Ithaca N. Y.

5. *Ablabesmyia pulcripennis* Lundbeck

1898 *Tanypus* Lundb. Vidensk. Meddel. p.293

(Pl.37, fig.17)

Male. Thorax cinereous black, with three wide black stripes, the median one posteriorly, the two lateral ones anteriorly abbreviated, the former divided by a fine longitudinal line, the intermediate space and the lateral margin of the dorsum with erect black pile; scutellum and metathorax black, the sternum and the sides of the thorax cinereous. Abdomen slender, black, with dense brown pile, the claspers quite large, shining, pilose. Antennae brownish. Legs brown or dusky, tibiae and tarsi white annulate. Halteres yellow. Wings densely clothed with hairs, and therefore cloudy; at the costal margin yellowish tinged, the costal veins pale brown, the others not colored. The venation as shown on pl.37, fig.17. The legs have long pile, the fore metatarsus is one-third shorter than the tibia.

Female. The female is shorter and stouter than the male, the legs are a little paler, the femora yellow, with the tips blackish brown. Legs all with shorter and less dense pile, the antennae brown, shorter than the thorax, in other respects like the male. Greenland. Translation.

6. *Ablabesmyia monilis* Linne

1758 *Tipula* Linn. Syst. Nat. ed. X. p.587

1767 *Tipula* Linn. Syst. Nat. ed. XII. 2:375

1804 *Chironomus* Meigen. Klass. 1:49, 24

1818 *Tanypus* Meigen. Syst. Besch. 1:60

1850 *Tanypus* Meig. Zett. Dipt. Scand. 9:3613

1864 *Tanypus* Meig. Schiner. Fauna Austr. 2:620

1877 *Tanypus* Meig. Wulp. Dipt. Neerl. 1:302

1776 *Tipula maculatus* Degeer. Mem. Hist. Ins. 6:394

1823 *Tanypus annulatus* Say. Jour. Acad. Nat. Sc. Phil. 3:15

(Pl.19, figs. 11, 12, 13, 14, 15, and pl.27, fig.6)

Larva. - The larvae were found in Ithaca and Saranac Inn, N. Y. They are yellow with brown markings; length 6-7 mm. Head brown, about twice as long as wide; antennae slender, 2.5 times as long as the mandibles, the basal joint about six-sevenths of the whole length. Mandible slender (fig.14 md) the apex black and sharp, the two lateral teeth short and sharp. Maxilla (mx) large with a mesad projecting process; its palpus (p) jointed, about one-half as long as the mandible, with a pair of apical papillae. Labium (l) with five black teeth, the laterals larger and longer than the median; hypopharynx (h) with a toothed margin, excepting its middle section (covered by the labium) which connects the lateral parts. The anterior claws are numerous, slender, curved at the tip but not pectinate. The abdomen is glabrous. The posterior appendages resemble those shown in fig.10, having elongate dorsal papillae each with about six apical setae. The claws of the anal prolegs differ from those of allied species in having two on each foot stouter, and much darker colored (fig.12) than the others (fig.11). Besides the stout dark ones there are the usual number of paler, stout marginals, and slender centrals.

Pupa. Dark yellow, mottled; length 3.5 to 4 mm. Respiratory organs ellipsoidal, dark colored (fig.13), smooth surfaced, the polygonal areas of the chitin distinctly visible. The apical aperture minute. At the base upon the thorax there is a transverse row of small, sharp tubercles. The surface of the abdomen without hairs, excepting the lateral margin of the last two segments, which have four or five long filaments. The caudal fin has two pointed lobes each with a pair of filaments.

Imago. Whitish; antennae of the male with pale brown hairs; of the female still paler; palpi yellowish. Thorax pale ashgray with five narrow longitudinal stripes, with wider intermediate spaces; the fine lines with hairs; scutellum reddish yellow, metanotum brownish black. Abdomen of the male with a more or less distinct interrupted longitudinal stripe, which broadens on the last segments; the claspers whitish, rather short (pl.32, fig.3). In the female the abdomen is wholly dark brown. Legs white, with narrow brown rings, one just before the tip of the femur, three on the tibia, two on the first tarsal joint and one on each of the following joints. In the male the fore tarsi and the hind legs are short haired; the fore metatarsus about one-fourth shorter than the tibia. Halteres white; wings with a whitish tint, hairy, with brown bordered crossveins and many brownish gray spots. R_2 is present, near the tip of R_1 ; the cubitus forking proximad of the crossvein. Length 3.5 to 4.5 mm.

I can not distinguish the American specimens from those which I have from Europe. The marks upon the abdomen of the male are quite variable; in some specimens they are simply spots on the posterior lateral margins of the segments, in others they form a broken median dorsal stripe, and in still others they are almost entirely wanting. The male genitalia in some specimens are somewhat brownish. The dark spots upon the wing are arranged as follows: One on the humeral crossvein, one on the discal crossveins, one at the tip of R_1 , and one at the tip of R_{4+5} . The paler spots are larger than the darker ones. There is one below the tip of R_{4+5} , one in the middle of cell R_{4+5} , a small one at the tip of the median, and one at the tip of each branch of the cubitus, one or two in the median cell and several in the anal cell. The fork of the cubitus is also clouded. Some of these spots are not always distinct because the color is due to the darker colored hairs, which are easily rubbed off. The wing of the female is usually darker than that of the male. (Pl.27, fig.6.) Specimens from New Jersey, Illinois, Ithaca, N. Y., South Dakota.

Osten Sacken, in a note in his catalogue of the North American Diptera (1878), first calls attention to the fact that *T. annulatus* Say and *monilis* Linn. may be synonymous. I have compared the North American species, which agree perfectly with Say's description, with specimens of *monilis* from Europe, and I can find no differences. For the sake of comparison, Say's description is given below.

Tanypus annulatus Say

Jour. Ac. Nat. Sc. Phil. 3:15. 1823

Tergum annulate with dusky; wings clouded with dusky and with three or four blackish points. Inhabits Pennsylvania.

Head and stethidium red-brown; thorax, the anterior dilated line with a brown line along its middle; feet white, thighs having an annulus near the tip, and tibia with one at base and two near the tip fuscous; wings with large, obsolete, dusky, spots or clouds, and three or four black-brown points, of which two are toward the middle of the wing, and the remainder on the costal margin near the tip; tergum segments with a dusky annulus at their bases. Length about $3/20$ in. Male.

7. *Ablabesmyia venusta* Coquillett1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:91

(Pl.27, fig.8)

Male. Head black, mouth parts brown, antennae pale yellow, middle of joints of basal half and whole of the apical joint brown, the hairs brown and yellowish; thorax black, opaque, mottled with grayish pruinose spots and lines; scutellum yellowish, its narrow base, stripe in middle, and nearly whole of under side dark brown; abdomen whitish, an interrupted band on the hind end of the first five segments and nearly the whole of the following segments brown; legs yellow, two bands near apex of each femur, one near base of each tibia, also apices of tibiae and of joints of tarsi brown; wings covered with hairs, hyaline, marked with about 11 brown spots located at extreme base of wing, on humeral crossvein, before middle of axillary cell, beyond middle of anal cell, on the central crossveins, near middle of cell R_{4+5} near apex of this cell, beyond middle of cell M and of cell Cu, and at the apices of the vein R_1 and of R_3 ; R_1 near its apex connected with R_3 by R_2 ; cubitus forks slightly before the crossvein. Length 4 mm. Los Vegas Hot Springs, N. M.

Four male specimens from Leland Stanford jr. University, California, agree with the description given by Mr. Coquillett, excepting that the fasciae at the posterior margins of the abdominal segments are not interrupted, but are produced forward a little at the middle. Upon the ventral surface of each segment in front of the posterior margin there is a black spot. The large basal joint of the antenna and the genitalia are brown. Halteres yellow.

Four female specimens from the same place are like the male, but the antennae are wholly fuscous, and the abdomen is darker, with more yellowish, and the venter is brown. The fore metatarsus is about six tenths as long as its tibia.

8. *Ablabesmyia guttularis* Coquillett1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:92

Head and its members dark brown, joints two to four of antennae, apices of the other short ones, and a space before the apex, light yellow, plumosity brown, changing into whitish at the apices; thorax black, opaque, gray pruinose, mesonotum marked with three indistinct dark vittae, the middle one divided by a median black line prolonged to the scutellum, the latter light yellow; the abdomen pale yellowish, first segment with two brown vittae, the others with a black fascia before the middle of each, hairs of

each segment consisting of an anterior whorl and a posterior transverse pair of clusters; legs light yellow, coxae black, a brown band before apex of each femur and another beyond base of each tibia, apices of tibiae and of tarsi brown, front tarsi ciliate with several rather long hairs; wings wholly covered with hairs, whitish hyaline, from base to small crossvein marked with four brown spots, one on humeral crossvein, two in anal cell, and one before apex of basal cell R, passing over the crossvein at apex of basal cell M and reaching the wing margin, where it is greatly extended and rather faint; a brown spot at base of vein R_{4+5} , apex of wing from slightly before the tip of R_1 grayish brown and containing several whitish hyaline drops; R_1 near its tip connected with R_3 by the oblique R_2 ; halteres whitish; length 5 mm. Two males. Pullman, Washington.

To the above description I may add that the female differs from the male in having the abdominal segments more yellowish, with narrow basal fasciae, and the wing markings are somewhat darker, the anal cell being brown with several hyaline spots; length 4 mm. Five females. Pullman, Washington.

9. *Ablabesmyia barberi* Coquillett

1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:90

Male. Yellowish white, apices and a broad band at middle of antennae; three vittae on mesonotum; the metanotum, spots on the pleura and sternum, black; mouth parts, a band near bases of segments 2 to 5; the whole of the following segments except their hind borders, also apices of femora, both ends of tibiae, apices of first four joints of tarsi and whole of last one, pale brownish; mesonotum opaque, gray pruinose; hairs of the antennae pale yellowish; wings covered with hairs, hyaline, from the base to the small crossvein marked with three brown spots, one on the humeral crossvein and two behind the anal vein; from small crossvein to wing tip are many, mostly isolated, brown spots; R_1 near its apex connected with R_3 by the oblique R_2 ; cubitus forks slightly before the crossvein; length 4 mm.

Female. Like the male except that there is no black ring at middle of the antennae, and the abdomen is dark brown, changing into yellow at the apex, the broad hind margins of the segments whitish; length 3 mm. Las Vegas, Hot Springs N. M.

10. *Ablabesmyia dyari* Coquillett

1902 *Tanypus* Coq. Ent. News. p.85

(Pl.19, fig.7, and pl.27, fig.9)

The pupa is figured and briefly described by Doctor H. G. Dyar (1902) p.56. He says, "It resembles a *Culex* pupa.

has the same habits, resting at the surface of the water with the slender funnel-shaped prothoracic air tubes penetrating the surface film and quickly descends when disturbed. The anal paddles resemble those of *Culex*, but are more hairy."

This species was also bred in a laboratory jar at Ithaca N. Y., the larva having been collected from one of the ponds in the vicinity. The empty larval skin of the single specimen was lost.

Pupa. Fuscous green. Respiratory trumpet (pl.19, fig.7) somewhat elongate, its free end open, the surface rugose. There are no blunt setae near the base. Body nearly devoid of setae, excepting the margin of the last two segments, which have four or five lateral filaments each. The caudal fin consists of two pointed lobes with ciliate margins (pl.19, fig.6).

- **Imago.** Male and female. Yellowish brown, the scutellum, abdomen, halteres and legs pale yellowish, the abdomen changing into yellowish brown toward the apex and with a similarly colored band on the preceding segments except the first, a brownish band before apex of each femur and near the base of each femur and near base of each tibia; antennal plumosity of male brown mixed with whitish and changing into white at the apex; mesonotum opaque, grayish pruinose, the three vittae indistinct, yellowish brown; abdominal segments 2 to 6 bearing near the base a dorsal cluster of rather long brown hairs; front tibiae only pubescent, their tarsi bearing a few rather long hairs, middle and hind tibiae densely covered with such hairs; wings densely haired, hyaline, a median band and the apical third brownish and marked with several hyaline spots; median band very irregular, greatly contracted at the middle and expanded at each end, the median crossvein about at its middle and clouded with darker brown, the hyaline spots principally situated near the hind margin of the wing; brown at apex of wing contains about eight hyaline spots and dots; cubitus forks slightly before the crossvein; length 3 to 4 mm. Washington D. C.; New York; Massachusetts; South Dakota; Pennsylvania, and Michigan.

In an immature specimen the parts of the body described above as yellowish are more or less green. Wing venation as figured on pl.27, fig.9. The fore metatarsus is but little over one-half as long as its tibia.

11. *Ablabesmyia johnsoni* Coquillett

1901 *Tanypus* Coq. Proc. U. S. Nat. Mus. 23:609

Male. Yellow, the scutellum, halteres, and tarsi white; apical joint of the latter, a band before apex of each femur and near base of each tibia brown, abdomen whitish, each segment with

an irregular brown mark, composed principally of two median vittae and a posterior arcuate fascia, most distinct on the median segments, on the apical ones expanded so as to cover nearly the entire dorsum; hairs of antennae mixed pale yellow and brown, their apices chiefly whitish, mesonotum opaque, whitish pruinose; in certain lights three dark yellow vittae are visible; front tarsi clothed with very short hairs, the first joint two-thirds as long as the tibia; wings whitish hyaline, almost wholly covered with yellow hairs, humeral crossvein bordered with brown, a broad pale brownish fascia crosses the wing just before the small crossvein, and a second slightly broader one at apex of R_1 , cubitus forking a short distance before the small crossvein; length 3.5 mm.

Female. Differs from the male as follows: Abdomen with dark yellow mottlings, destitute of brown markings, hairs of antennae whitish, vittae of mesonotum more distinct; length 3 mm. Riverton N. J.

12. *Ablabesmyia ornata* Meigen

1838 *Tanypus* Meig. Syst. Besch. 14, 7:31

1864 *Tanypus* Schiner. Fauna Austr. 2:620

1877 *Tanypus* V. d Wulp. Dipt. Neerl. p.304

Male. Pale yellow; the antenna and its hairs of the male pale brown. Thorax with three deeper yellow stripes; the two lateral ones bounded anteriorly by a fine brown or black line, which is continued over the plemra to the base of the wing; metanotum brownish. Abdomen with slightly darkened incisures; the last segments of the male brownish yellow; claspers yellowish, quite stout. Legs whitish; near the apex of the femur a brownish ring; the tips of the tibiae slightly browned; fore metatarsus a little shorter than the tibia; fore tarsi of the male slightly ciliate. Halteres white. Wings hairy, pale yellow, with two cross bands and a dark spot at the anterior margin a short distance from the tip; the crossveins blackish bordered; the venation as usual. Length 5.5 mm.

Var. a. female. Differs from the above in having the abdomen with mottled dark brown irregular fascia on each segment. The fore metatarsus about three-fourths as long as its tibia.

Var. b. female. Differs from the typical form in having three distinct, opaque, ferruginous thoracic stripes, humeri white, anterior margin of the dorsum narrowly blackened; no blackish pleural spots; metanotum and sides of scutellum ferruginous or brownish. Abdomen brown, segments with paler posterior margins. The brown clouds on the wings so coalesce that the wings may be described as having two wide, irregular cross bands, one before the middle and one between the middle and the tip; crossveins almost black. Several specimens, Ithaca, N. Y.

13. *Ablabesmyia algens* Coquillett1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:90

Female. Yellow, three vittae on the mesonotum; the metanotum, spots on the pleura, and the sternum, brownish black; mouth parts, apices of femora, and bases of tibiae brownish; mesonotum grayish pruinose, the vittae somewhat polished; wings covered with hairs, hyaline, crossed at the middle by a faint brownish band which extends from small crossvein half way to the wing tip; R_1 near its apex connected with R_3 by the oblique R_2 ; cubitus forks slightly before the crossvein; length 3 mm. Popoff Island, Alaska.

14. *Ablabesmyia discolor* Coquillett1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:89

Female. Yellowish brown; antennae, scutellum, large portion of abdomen, legs except apices of femora and tibiae, also the halteres, yellow; mesonotum grayish pruinose, most dense at the humeri and in front of scutellum; wings whitish hyaline; two crossbands and the apex largely brown; the first band is on a line with the humeral crossvein, and along costa is broadly connected with the second band, which is located at the small crossvein; behind the cubitus the second band is prolonged to meet the brown at apex of wing; the latter begins a short distance before the apices of R_1 and of Cu_2 , and encloses a large hyaline spot in apex of cell M and cell Cu_1 , also two yellowish costal spots; the brown along the costa comprises two spots of a darker color than the remainder of the brown at the apex of the wing, and between the first of these spots and the preceding brown band is a large yellow costal spot; wings densely covered with hairs, which are yellowish on the hyaline portions and brown on the dark spots; R_1 connected with R_3 a short distance before its tip by the oblique R_2 . Cubitus forks slightly before the crossvein. Length 3 mm. New Hampshire.

15. *Ablabesmyia melanops* Wied. (Meig.)1818 *Tanypus* Meigen. Syst. Besch. 1:65, 181850 *Tanypus* Zett. Dipt. Scand. 9:36211864 *Tanypus* Schiner. Fauna Austr. 2:6211877 *Tanypus* V. d. Wulp. Dipt. Neerl. p.3061757 *Tipula farundineti* L. Fauna Suec. ed.II. p.4341818 *Tanypus* Meig. Syst. Besch. 1:66, 191823 *Tanypus bicolor* Fries. Monogr. Tanyp. Suec. 17, 12

Pale reddish yellow, including the antennae, palpi, legs and halteres; eyes black. Thorax with three reddish longitudinal stripes, the median one divided; the intermediate spaces and the

flattened area in front of scutellum with a whitish sheen. Abdomen of the male whitish; the posterior segments sometimes with reddish longitudinal stripes. The abdomen of the female a pale flesh color. Legs almost white. Fore metatarsus about three fourths the length of its tibia; the fore tarsi of the male and the hind legs hairy. Wings whitish, unspotted, with pale hairs and almost colorless veins; R_2 short, near the tip of R_1 appearing like a crossvein, but difficult to see on account of the hairs; the cubitus forks proximad of the crossvein, the latter being proximad of the middle of the wing. Length 3.5 to 4.5 mm. Specimens from Ithaca, N. Y., Michigan, Nebraska and New Jersey. I can not distinguish the American specimens from those which I have from Europe. The dorsal stripes of the thorax are buff-colored, but they are usually distinct.

Var. b. female. Thoracic stripes reddish. Length 2.5 mm. From Ithaca, N. Y.

16. *Ablabesmyia flavifrons* n. sp.

Larva. The larvae were found rather abundantly in a small ditch of flowing water. Ithaca, N. Y.

Sordidly white, slightly mottled with brownish; length 9 mm. Head pale brown, about 1.5 times as long as wide; the parts of the head resemble those figured on pl.20, fig.6. The antennae are about 2.5 times as long as the mandible, the basal joint being nearly seven eighths of the whole length. The maxilla is large, the palpus prominent but shorter and stouter than that shown in the above-mentioned figure (compare figs. 1 and 14). The labrum, hypopharynx, and the feet are like those of *monilis* (pl.19, fig.14), but all the claws of the posterior feet are of the same color.

Pupa. The only essential difference between this pupa and that of *monilis* (pl.19, fig.8) is the absence of the row of tubercles at the base of the breathing trumpet and the form of the trumpet. The latter is rather small, about two thirds as long as the third abdominal segment, enlarged at the apical end (pl.19, fig.2).

Imago, male. Yellowish white and brown. Abdomen fasciate. Legs pale. Length 3.5 to 4.5 mm.

Head yellow, palpi and tip of proboscis subfuscous; basal joint of the antenna dusky, flagellum brown with brown hairs, second antennal joint yellow. Pleura, scutellum and dorsum of thorax pale yellow, the last with three broad, dull brown stripes, the middle one divided; sternum and metanotum blackish. Abdomen pale yellow, the anterior third or half of each segment brown; genitalia and venter pale yellow. Legs yellowish, tarsi some-

times slightly darker, extreme tip of each tibia with black speck; fourth tarsal joint linear; fore metatarsus about three fourths as long as its tibia; fore tarsi and middle and hind legs with rather long hairs. Wings hyaline, pale yellow haired, crossvein not clouded; R_2 present near the tip of R_1 , cubitus forking slightly before the crossvein. (Pl.27, fig.11.) Halteres pale.

Female. Antennae wholly yellow, except fuscous apical joint; abdomen dusky yellow, posterior margins of segments slightly paler.

This species agrees with the description of *nigropunctatus* Staeger (1839), but the sternum and metanotum are dusky and not yellowish. Several bred specimens Ithaca, N. Y.; Idaho; Pullman, Washington.

17. *Ablabesmyia flaveola* Williston

1896 *Tanypus* Will. Trans. Ent. Soc. Lond. p.275

Male. Posterior forked cell not petiolate; wings hairy; front metatarsi nearly as long as their tibiae. Light yellow; antennae brownish, the plumosity gray; abdomen somewhat infuscated towards the tip; legs light yellow throughout, with rather abundant light yellow hair; wings hyaline, clothed moderately densely with gray hair. Length 1.5 to 2 mm. St Vincent Island, West Indies.

18. *Ablabesmyia pallens* Coquillett

1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:91

Male. Head brown, mouth parts and basal joint of antennae concolorous, remainder of antennae yellow, the hairs brown and whitish; thorax whitish, three vittae on mesonotum, metanotum, spots on the pleura and sternum dark yellow; abdomen pale yellow, a band near base of segments 2 to 5 and nearly the whole of the following segments, pale brownish; legs and halteres whitish; wings hyaline, covered with hairs, R_1 near its apex connected with R_2 by the oblique R_2 ; cubitus forks slightly before the crossvein; length 2.5 mm.

Female. Abdomen wholly yellow, otherwise as in the male; length, slightly over 1 mm. Las Vegas, Hot Springs, N. M.; New Jersey, (Johnson, '04).

Var. a, (pl.27, fig.14.)

Male. Dorsum of thorax with three wide fuscous stripes, humeri and scutellum yellow, the latter perhaps a little darker. Pleura brown, metanotum and sternum blackish. Palpi and proboscis yellow. Specimens from Ithaca, N. Y.

19. *Ablabesmyia indecisa* Williston1896 *Tanypus* Will. Trans. Ent. Soc. Lond. p.276

(Pl.27, figs. 12 and 13)

Male and female. Wings hairy; posterior forked cell not petiolate; front metatarsi shorter than their tibiae. Head and basal joint of the antennae reddish yellow; palpi and the remainder of the antennae brownish yellow; antennal plumosity of the male gray, towards the tip blackish. Thorax reddish yellow; bare, opaque, with three slender, reddish brown stripes in front, separated by ashy intervals; on each side posteriorly with an elongate brown spot, the middle of which is ashy; scutellum light yellow; metanotum brownish red. Abdomen slender; opaque brown, the posterior angles and borders of the segments ashy; the yellow of the venter sometimes encroaches upon the brown of the dorsum; sixth and seventh segments more distinctly yellow; the seventh and eighth segments with the posterior portion blackish. Legs yellow, less hairy than in *A. flavicola*. Wings hyaline, moderately hairy. Length 1.5 to 2.25 mm. St Vincent Island.

I have compared my male specimens with the cotype male specimen from the St Vincent collection of Cornell university, and cannot detect any differences.

Var. a. (fig.12). Male and female; agrees with Williston's description, excepting that there are but two reddish brown stripes in front (i. e. the usual middle stripe with a very slender dividing line); and all the abdominal segments are marked alike with ashy borders.

To Williston's description of the normal species the following may be added: The brown of each segment of the abdomen more intense just in front of the ashy posterior margin. The abdomen of the female is reddish brown, the incisures yellow and the margins of the segments ashy. Specimens from Ithaca, N. Y., and Pennsylvania.

20. *Ablabesmyia pilosella* Loew1866 *Tanypus* Loew. Berl. Ent. Zeit. p.5

Female. Testaceous or subfuscous, with pale pile, the dorsum of the thorax without stripes, the scutellum, legs and antennae very pale, the last with long pile and toward the tip blackish, the wings thickly pilose, subcinereous, the basal cells short. Length 1 mm. Wing 1.2 to 1.3 mm.

Small, opaque, testaceous or subfuscous. The antennae ordinary, pale, blackish towards the tip, clothed with very long pile, the last joint not thickened. The dorsum of the thorax without

the usual stripes, sometimes whitish; scutellum pale. Legs and halteres whitish; wings thickly pilose, subcinereous, the costal margin somewhat yellowish, the basal cells short. Translation. (Loew.) District of Columbia.

Through the kindness of Mr S. Henshaw of Cambridge, Mass., who examined the type for me, I may add that the fork of the cubitus begins before the M-Cu. crossvein; the basal cells are short, one third or less than the wing in length, and the abdomen is brownish.

21. *Ablabesmyia tibialis* Staeger

1845 *Tanypus* Staeger. Groenl. Antl. Nat. Tids. 2 den. R. B. I. 354

Blackish; halteres and legs pale fuscous, hind tibiae of the male long pilose; wings grayish, hairy. Length 2.5 mm.

Male. The blackish body is without markings; thorax dark; abdomen is somewhat shining and fuscous haired. The legs are sordidly yellowish brown, sparsely haired; the tibiae, particularly the hind pair, are long-haired. The wings are covered with gray hairs; the vein R_1 runs parallel with the wing margin and ends one third the wing length from the tip, R_{4+5} ends near the tip, the oblique R-M crossvein being near the middle of the wing; the media is slender and ends at the wing tip; the fork of the cubitus lies directly under the R-M crossvein; the M-Cu. crossvein is vertical (its position is not stated by Staeger); the branches of the radius are stout, but the cubitus and the anal veins are nearly invisible.

Lundbeck (1898) p.294 describes the female as follows:

Female. Resembles the male, but the abdomen is shorter and stouter; the wings are wider and the veins are a little stouter; with long pile on the hind tibiae, though not so long as that of the male; in other respects like the male.

Greenland (Staeger and Lundbeck).

22. *Ablabesmyia fastuosa* n. sp.

(PL19, figs. 16-19)

A single larva from Eddy pond, Ithaca, N. Y., in April.

Larva. Reddish, length about 7 mm. Head brown, rather short; about $1\frac{1}{2}$ times as long as wide; antennae more than twice as long as the mandible. The basal joint about two thirds of total length (fig.17). Mandible resembles that of *monilis*, but with a broader lateral tooth (fig.16). Maxilla prominent with long palpus, hypopharynx and labium like that of *monilis*; the latter, however, has teeth in the middle shorter than the lateral ones, while the former has the teeth nearly equal in length.

Feet as usual, all claws of the same brownish color. Dorso-anal papillae with six to eight setae. Blood gills as in *monilis*.

Pupa. Pale fuscous. Length about 4 mm. Breathing trumpet (fig.18) about three times as long as broad, with large apical aperture, its surface spinose scaled. The surface of the abdomen under a very high magnification appears finely punctate. The lateral margin of the last two segments with the usual 4 or 5 filaments. The caudal fin (fig.19) has two pointed lobes, the surface covered with minute spinose scales.

Imago. Female, fuscous, legs and wings unmarked, the latter hairy and with darkened crossvein. Length about 3 mm.

Head, including palpi, proboscis, and antennae fuscous; eyes black. Thorax, including pectus, pleura, scutellum and metanotum fuscous; the dorsum, with the humeri, space in front of scutellum and three fine longitudinal lines more cinereous, in some lights the other parts appear more cinereous. Hairs dusky, abdomen fuscous, posterior margins of the segments cinereous; the hairs pale. The legs pale fuscous; the extreme tips of the tibiae darker. Fore metatarsus 0.6 as long as its tibia. The wings subhyaline, hairy, unmarked, crossveins and the radius darker than the other veins, crossveins specially distinct, R_2 present; cubitus forks a little proximad of the crossvein. Halteres white. Bred specimen. Ithaca, N. Y. Michigan. A specimen from Pullman, Wash., has dorsum of thorax and scutellum yellowish, the three dorsal stripes distinct, dull brownish black.

23. *Ablabesmyia hirtipennis* Loew.

1866 *Tanypus* Loew. Berl. Ent. Zeit. (Centur. VII). p.5

Female. Wholly fuscous, wings about the same color, thickly pilose, crossveins black, all of the tarsal joints linear. Length 3.5 to 3.8 mm. Wing 4.1 to 4.2 mm.

Fuscous; antennae, the posterior margin of each of the abdominal segments and the femora, excepting the tip, rather paler, palpi darker; the tarsi long in proportion, dark fuscous toward the tip, all its joints linear, decreasing in length, the last one shorter than the one preceding. Wings cinereous fuscous, thickly covered with long fuscous pile, the veins as is usual with the species of this genus, the crossveins black, the others sub-fuscous, R_{4+5} running into the margin of the wing near its tip. Translation. Maine.

Mr. S. Henshaw of Cambridge, Mass., who kindly examined the type for me, writes that the fork of the cubitus begins proximad of the crossvein, the halteres are luteous, and the thorax is striped.

24. *Ablabesmyia nigropunctata* Staeger.1839 *Tanypus* Staeger. Kröjer; Nat. Tidsskr. 2:589, 161850 *Tanypus* Zett. Dipt. Scand. 9:36241864 *Tanypus* Schiner. Fauna Austr. 2:621

Male and female. Whitish; antennae pale; eyes black. Thorax in dried specimens yellow, in life with a reddish tinge; dorsal stripes pale; sternum and metathorax yellow; scutellum white. Abdomen whitish, slender in the male, pilose, the last three segments a little wider, each segment with a brown, basal transverse fascia on dorsal surface, venter spotless; anal appendages white. Abdomen of the female stouter, pubescent, spotless. Wings white, spotless; halteres white. Legs white; fore metatarsus about one fourth shorter than its tibia. Fore legs of the male without long hairs. Pullman, Washington.

25. *Ablabesmyia* (?) sp.

A larva from Beebe lake, Ithaca, N. Y., is yellow; 5 or 6 mm. long; resembles *P. adumbratus* in having a short head, comparatively short antennae and in shape of the mandible; but differs in having but four marginal teeth in the labium (pl.19, fig.5) and in having rather more slender marginal claws in the posterior feet.

Genus 18. *Isoplastus* Skuse.

Proc. Linn. Soc. N. S. W. p.279. 1889

Antennae in the male 15-jointed, in the female 12-jointed. Wings pubescent. Marginal crossvein (R_2) and second longitudinal vein (R_3) pale and indistinct. Fork of the cubitus with its base at base of M-Cu. crossvein.

This genus was erected to contain several Australian species. It may later be found that this genus can not be separated from *Ablabesmyia* in which case the name *Isoplastus* has precedence.

Genus 19. *Tanypus* Meigen.

Illiger's Magaz. (part.) p.261. 1803

One of the subdivisions of the old genus *Tanypus* of Meigen. Wings hairy; cubitus forks distad of the M-Cu. crossvein, and is therefore petiolate.

Skuse (1889) gives the name *Tanypus* to the group having hairy wings and the fork of the cubitus sessile; but since Meigen gave the species *cinctus* (= *punctipennis*) as the representative of the genus, and since it possesses a petiolate cubitus,

it appears to me that the name should be retained for species having this character.

KEY TO SPECIES OF TANYPUS

Imagines

- a* Wings clouded (banded or spotted)
 - b* Legs nearly uniform in color; wings uniformly spotted with fuscous; thorax with three dusky stripes; legs yellow; length 4.5 mm.; female *Ablabesmyia pictipennis*
 - bb* Legs distinctly bicolored. Femora brownish with white subapical rings; abdomen blackish (New York and Texas)....1. *stellatus*
- aa* Wings not clouded, excepting sometimes the crossveins or a faint smokiness near apical end; dusky species
 - b* Halteres pale fuscous; blackish species; legs sordidly yellowish brown; wings grayish, hairy; tibia long-haired; thorax dark; abdomen somewhat shining and fuscous haired; anterior crossvein in the middle of wing; length 2.5 mm. (Greenland)
 - 21. *Ablabesmyia tibialis*
 - bb* Not as above
 - c* Scutellum black; legs usually brownish or black
 - d* Apical half of wing smoky; abdomen brown....4. *culiciformis*
 - dd* Apical half of wing not smoky
 - c* Thorax gray with black stripes; abdomen cinereous black; M-Cu crossvein far proximad of the fork of the cubitus; halteres sordidly yellow; fore metatarsus but little more than half as long as the tibia; length 2 to 3.25 mm.
 - 2. *posticalis*
 - cc* Thorax with lateral ferruginous stripes; crossveins clouded; fore metatarsus about three fourths as long as its tibia; length 4 mm.....3. *crassinervis*
 - cc* Scutellum yellowish; legs usually paler brown or yellow
 - d* Apical half of wing distinctly smoky, especially near the anterior margin; abdomen dark brown; length 3.5 to 4.5 mm. (New York)4. *culiciformis*
 - dd* Wing nearly hyaline; abdomen with whitish incisures
 - 5. *choreus*

The species *pictipennis* and *tibialis* Staeger have been included in the foregoing as well as in the key for *Ablabesmyia* because there is some doubt as to the position of the M-Cu. crossvein. They are, however, described with *Ablabesmyia*.

Tanypus tibialis Say (6) and *Tanypus baltimorens* Macq. (7) are not sufficiently described to place in the keys; both of these descriptions are reproduced in the body of this work. *Tanypus annulatus* is a synonym of *A. monilis*, and *T. decedens* Walker is perhaps the same as *pictipennis* Zett.

1. *Tanypus stellatus* Coquillett

1902 *Tanypus* Coq. Proc. U. S. Nat. Mus. 25:89

Yellowish brown, antennae except the basal joint pale yellow, abdomen blackish, a whitish ring at three fourths the length of each femur, tibiae except each end, and tarsi except apices of the joints, light yellow, halteres light yellow; mesonotum thinly grey pruinose; wings covered with brown hairs, whitish hyaline, marked over nearly the entire surface with many brown spots, several of which are confluent and enclose small whitish spots; costal cell except at its apex brown; R_1 near its apex connected with R_3 by the oblique R_{2+3} , cubitus forks a short distance beyond the crossvein; length 2 mm. Female. Texas, Kansas, New York.

Some male and female specimens captured in Ithaca, N. Y., I have identified as this species. The females agree very well with the description given by Mr Coquillett; the descriptions of the specimens are as follows:

Male. Head, palpi and basal joint of antenna fuscous, the antenna and its hairs a trifle paler. Dorsum of thorax with three dull dark-brown stripes, the middle one divided; the fine lines separating the dark dorsal lines, the lines separating the dark humeral spots from the lateral lines, the anterior margin, and the posterior margin of the middle line, cinereous white. The two minute tubercles of the collar sometimes pale. Metanotum, pleura and sternum, dark brown; scutellum a little paler. Hairs pale. Abdomen dull brown, the posterior margins of the segments whitish. Claspers short, stout, and dark brown. Coxae brown, each femur brown, with a white ring not far from the apex, each tibia yellow with brown base and tip, tarsi yellow, joints black at tip, last joint darker; fourth tarsal joint slender, and longer than the fifth. Wings with many brown spots, that upon the crossveins most conspicuous. Two near the tip of R_1 , one on the humeral crossvein, one dark one on the median crossveins, four in cell R_{4+5} , each divided longitudinally by a wing fold; two or three in the cell M; one or two between branches of the cubitus; and several in the anal cell. Venation as shown. Halteres sordidly yellow, the knobs somewhat infuscated, their tips paler. Length 3 mm.

Female. (Pl.27, fig.7.) Like the male, but the abdomen is usually wholly brown, occasionally the margins of the segments very narrowly whitish. Tibiae excepting the knees sometimes brown. Length 2 mm.

2. *Tanypus posticalis* Lundbeck

1898 *Tanypus* Lund. Vidensk. Meddel. p.295

Thorax black, shining, with two longitudinal cinereous stripes; or it may be described as having three wide black stripes, shining,

the median one posteriorly, the lateral ones anteriorly abbreviated, and the median one is divided by a fine line; the intermediate space and the lateral margins have some erect yellow pile; scutellum and metanotum black; abdomen slender, cinereous black, with long yellow pile, claspers quite large, pilose. Antennae blackish brown; legs more or less dubitely brown. Halteres sordidly yellow. Wings hyaline, distinctly but not densely hairy, the costal vein brown, the others pale, the cubitus forks far distad of the M-Cu. crossvein (pl.37, fig.20). The second and third pairs of legs with long pile, the first pair bristly, the fore metatarsus a little more than half the length of its tibia. Male. Length 2 to 3.25 mm.

The female is shorter than the male, stouter, the antennae shorter than the thorax; in other respects like the male. North Greenland.

3. *Tanypus crassinervis* Zetterstedt

1838 *Tanypus* Zett. Ins. Lappon. 817. 1

1845 *Tanypus* Zett. Staeger. Nat. Tids. p.354

1850 *Tanypus* Zett. Dipt. Scand. 9:3599

1898 *Tanypus* Zett. Lundbeck. Vid. Med. p.294

Black, opaque, halteres whitish, lateral margin of the thorax ferruginous, antennae brown, wings white, somewhat hairy, anterior veins conspicuous, crossvein infusate, R_2 present, the fork of the cubitus petiolate; legs blackish or fuscous, fore tarsi bare, metatarsus about one fourth shorter than the tibia. Length about 4 mm.

Male and female. Resembles *P. nervosus* (an European species) but is a little smaller, the body opaque, not shining, the wings with pale hairs, and the legs unicolored. Head black; antennae dark, the hairs (in the male) brownish; palpi dark, thorax black, lightly cinereous shining, dorsum of the thorax in the male with a lateral ferruginous stripe, the humeral spots sometimes more distinct; in the female often reddish yellow, with three wide black stripes, the lateral ones abbreviated anteriorly. Scutellum and metanotum black. Abdomen black, in the male pilose, genitalia small, ovate; abdomen of the female pubescent. Wings white, slightly hairy, anterior veins distinctly fuscous, crossveins more deeply infuscated, the posterior veins distinct but paler. Venation as in *P. nervosus* (pl.37, fig.24). Legs formed as in the latter, sometimes brown, sometimes fuscous testaceous. An European species, also recorded from Greenland by Staeger (1845) and Lundbeck (1898).

4. *Tanypus culiciformis* Linne

1767 *Tipula* Linn. Syst. Nat. ed. XII. 2:978

1805 *Chironomus* Fabr. Syst. Anth. 47, 44

- 1818 *Tanypus* Meig. Syst. Besch. 1:63, 13
 1850 *Tanypus* Zett. Dipt. Scand. 9:3610, 17
 1864 *Tanypus* Schin. Fauna Austr. 2:617
 1877 *Tanypus* V. d. Wulp. Dipt. Neerl. 299, 4
 1826 *Tanypus fasciatus* Macq. Rec. Soc. Sc. Agri. Lille. 187, 5
 1838 *Tanypus tenuis* Meig. Syst. Besch. 7:15, 34

Male. Head dark brown, including mouth parts and antennae. Dorsum of the thorax with three dark brown stripes, the middle one divided by a fine line. Humeri and scutellum yellowish brown, sternum and metanotum and sometimes scutellum also, blackish; the pleura a little paler. Abdomen dark brown, the posterior margins of the segments paler, more yellowish; hairs brown. Genitalia short and robust (pl.32, fig.2). Legs yellowish or brownish; the tips of the femora, tibiae, and all the tarsal joints darker. The metatarsus usually yellowish. Fourth tarsal joint linear and longer than the fifth; the fore metatarsus about one fourth shorter than the tibia; the fore tarsi and the posterior legs somewhat hairy, wings hairy, hyaline, the apical half smoky, especially near the anterior margin; crossveins dark clouded, R_1 with R_2 near its tip, the petiole of the cubitus about one half as long as the fork (pl.27, fig.15). Halteres white.

Female. Antennae except apical joint yellowish; the humeri paler and the legs less hairy than in the male. Length 3.5-4.5 mm.

A number of specimens from Ithaca, N. Y., one from Riverton, N. J., one from Idaho, and one from Chicago, Ill., I cannot distinguish from European specimens.

5. *Tanypus choreus* Meigen

- 1804 *Tanypus* Meigen. Klass. 1:23, 6
 1818 *Tanypus* Meigen. Syst. Besch. 1:62, 12
 1839 *Tanypus choreus* Meig. Staeger. Nat. Tids. 2:585, 7
 1850 *Tanypus* Meig. Zett. Dipt. Scand. 9:3609, 15
 1864 *Tanypus* Meig. Schin. Fauna Austr. 2:617
 1877 *Tanypus* Meig. V. d. Wulp. Dipt. Neerl. 299, 5
 1804 *Tanypus fasciatus* Meig. Klass. 1:21, 3
 1804 *Tanypus sylvaticus* Meig. Klass. 1:24, 9

Antennae brown, including the antennal hairs of the male; palpi more or less brown. Thorax brown, with three darker longitudinal stripes, the spaces between the longitudinal stripes and the flattened area in front of the scutellum whitish; sternum greyish; scutellum yellow; metanotum black. Abdomen brown-black with whitish incisures; venter yellow anteriorly; the anal segment of the male broad and flattened, the claspers short, yellow basally, blackened toward the tip. Legs yellowish brown; the tips of the femora and of the tibiae and the whole of the last four tarsal joints brown; the first joint of the fore tarsus is

one fourth shorter than the tibia; fore tarsi of the male bearded. Halteres whitish. Wings slightly hairy, hyaline, slightly smoky near the tip; the crossvein brown clouded; the cubitus forking distad of the crossvein; venation resembling that of *P. nervosus* (pl. 37, fig. 24).

The female is usually somewhat lighter colored. Length 3.5 to 4.5 mm. Translation from V.d. Wulp (1877). "Coloring somewhat variable." Schiner (1864). North America (Osten Sacken, 1878).

6. *Tanypus tibialis* Say.

1823 *Tanypus* Say. Journ. Ac. Nat. Sc. Philad. 3:15, 2

1828 *Tanypus* Wied. Ausser. Europ. Zw. Ins. 1:20, 4

1878 *Tanypus* Ost. Sack. Catl. Dipt. N. A. p.22

Thorax reddish brown; tibia white at base; abdomen white, a double band on the middle and tip black. Habitat: Pennsylvania.

Wings immaculate; joisers white; feet fuscous, basal half of the tibia white; tergum, second joint with a spot each side, two middle segments with each a band, of which the anterior one is much broader, and terminal segments deep fuscous, pleura yellowish. Length of male more than 1.20 in.

7. *Tanypus baltimoreus* Macquart

1855 *Ternipus* Macq. Dipt. Exot. Suppl. V. 15, 1

1878 *Tanypus* Ost. Sack. Catl. Dipt. N. A. p.21

Female. Palpi tawny, shining cinereous. Antennae wanting. Thorax with wide black bands; abdomen black, posterior margins of the segments white. Legs tawny; tarsi dusky. Halteres brown. Wings greyish, with an oblique black line; veins normal. Length 3.5 mm. From Baltimore. Translation.

Judging from the description this species seems to resemble *T. culiciformis*, but it has brown halteres. Nothing is said either about the wing venation with respect to fork of the cubitus, whether sessile or petiolate; or whether the wing is hairy or bare; it is therefore impossible to say to which one of the four genera of the group *Tanypus* it belongs.

Genus 20. *Pentaneura* Philippi

Verh. z. b. Ges. 35. 629. 1865

The antennae equal in length to the head and thorax taken together, moniliform, 12-14 jointed, verticillate with long hairs, the joints subglobose, not petiolate, the last joint elongate. Palpi elongate, equaling the antennae, joints subcylindrical. Wings

narrow, very hairy, venation as shown on pl.37, fig.16. Legs hairy, elongate, especially the tarsi; first tarsal joint equal to the two following in length; fourth and fifth together equal to the third. Type, *P. grisea* Ph. Chile. No North American species.

Genus 21. *Podonomus* Philippi

Verh. z. b. Ges. 7. 601. 1865

Thorax strongly produced over the head. Antennae of the female short, subcylindrical, verticillate with long hairs, eight (?) jointed, the last joint equal to the two or three preceding (pl.37, fig.10). Venation as shown on pl.37, fig.11. Legs elongate, equal, tarsi elongate, the metatarsus about the same length as the tibia, the second about one half as long as the first, the remaining ones short and of equal length. Type, *P. stigmaticus*, Chile.

From the wing venation it appears that this genus is related to the group *Tanypus*. No North American species.

Genus 22. *Heptagyia* Philippi

Verh. z. b. Ges. 41. 635. 1865. (Pl.37, figs. 21, 22, 23)

Head small. Antennae short, 7-jointed, cylindrical, first joint large and thick, the following subequal, the last one oblong, equaling the two preceding ones taken together. Ocelli none. Palpi long, 6-jointed, almost exceeding the antennae, first three joints subcylindrical and equal, the fourth and fifth shorter and subglobose, the last one slender, oblong, equalling the fifth one in length. Thorax very much swollen, with a deep suture near and parallel to the anterior margin. Wing venation as shown in fig.21. Legs elongate, slender, anterior femora not thickened, not armed, anterior tibiae with unarmed extremities, posterior tibiae with minute apical spines; tarsi elongate, first joint nearly equalling the remaining ones in length. Type, *T. annulipes* Ph. Chile. No North American species.

Genus 23. *Corynocera* Zetterstedt

Insecta lapponica 556. 1858

Head moderately large, transverse; antennae porrect, shorter than the thorax, arcuate, cylindrical, about 12-jointed; the first joint short, thick, bare, the following 10 very small, rounded, closely sessile, delicately haired, the 12th elongate, conical, wider,

bare; palpi slightly projecting, bent, proboscis short; eyes round, somewhat prominent, remote; front wide; ocelli wanting; dorsum of thorax elongate, arched, higher than the head, no transverse suture, somewhat depressed in front of the scutellum; scutellum small. Abdomen 7 or 8 jointed. Legs short, robust, of unequal length, wholly bare and unarmed; coxae not elongate; halteres short. Wings as long as the abdomen, club-shaped, rather narrow, bare, with 4 or 5 discal veins diverging apically, all very indistinct; on the anterior margin at the apex is a long somewhat curved seta; the posterior margin is not ciliate. The wings of the female are shorter than the abdomen, the genitalia of the male clubbed, legs more robust; the abdomen of the female pointed, with two short appendages. Metamorphosis and life history unknown. Translation from Schiner p.641 (1864).

The only species of this genus is *C. crassipes* Zett. (=ambigua Zett.), a small, brownish black fly, with pale legs, whitish wings and halteres. Length 2 to 2.25 mm. Lapland and Germany (Beuthin).

Genus 24. *Spaniotoma* Philippi

Verh. z. b. Ges. 35. 629. 1865. (Pl.37, figs. 13 and 14)

Thorax prominent above the head. Antennae short, scarcely exceeding the palpi in length, 6-jointed, the joints oval, sparsely verticillate with short hairs, the last joint rather acute. Palpi 4-jointed, the first joint thickened, the last one slender, elongate, divided (?).

The wing venation (fig.13) resembles that of *Chironomus* (sens. lat.) though the crossvein is rather nearer to the base of the wing than in the typical *Chironomus*. The description does not state whether the wing is hairy or bare. The figure given by Philippi shows the fore metatarsus shorter than its tibia. The genus may possibly be synonymous with either *Metricnemus* or *Orthocladus*.

Type *S. bivittata* Philippi, Chile. No North American species.

Genus 25. *Corynoneura* Winnertz

Stettin, Ent. Zeitg. 7:12. 1846. (Pl.36, fig.7, and pl.32, fig.4)

Small species, distinguished by the absence of the anal angle of the wing. Head round, proboscis short, palpi incurved, four-

jointed, the last joint elongated. Antennae of the male 10-jointed, the first joint thick and disk-like, the following eight egg-shaped, the last one thicker and longer than the others, all with long hairs, the last one verticillate; antennae of the female 6-jointed, the first one thick and disk-like, the following four ellipsoidal, the last one somewhat elongate, all with short hairs. Eyes round, ocelli wanting. Mesothorax greatly arched, prolonged over the head, without transverse suture; scutellum small; metathorax much arched. The 8-jointed abdomen is narrow and long. Legs elongated; slender; the posterior pair of tibiae somewhat thickened, spurred; metatarsi elongated; claws and pulvilli very small. Wings in outline club-shaped, bare, and bent down; anal angle wanting; anterior margin thickened. Halteres free; venation as shown on pl.36, fig.7. Genitalia of male shown on pl.32, fig.4 (after Kieffer). Antennae of male 11-jointed according to Kieffer (1899).

Of the larvae and pupae of the members of this genus, but one species has been described as far as I am aware; i. e. *Corynoneura lemnae* Fraenfeld (1866). (Pl.36, figs. 1 to 5.) He describes the larvae as filiform, thickened anteriorly, white, with distinct incisures (fig.1). The chitinous pale brown head is oval, with two black eye spots. The antennae 3-jointed 1.5 times as long as the head. The first thoracic segment is in the form of a truncated cone, upon the ventral side of which is a cephalad projecting process, with a bilobed extremity, each lobe possessing a crown of delicate setae. The next thoracic segment largest, with two oval, stigma-like spots on each side. The following 8 gradually decreasing in size; the last is nearly cylindrical, and has upon the dorsal surface a prominence upon which there are several upright setae. There are two anal blood gills and two prominent anal prolegs, at the extremity of each of the latter there is a circle of curved setae. Length 3.7 mm.

The pupa is described as being smooth and pale yellow in color; the wing sheaths being one third of the entire length. The abdominal segments are distinct; the anal end is blunt, upon each side with a hyaline crescent-shaped disk, each with 8 long setae upon its margin (fig.4 and 5). Length 1.2 mm. The imago resembles *C. scutellata* Winn. (an European species).

1. *Corynoneura atra* Winnertz1852 *Corynoneura* Winn. Stett. Ent. Zeit. 13, 50, 41864 *Corynoneura* Schiner. Fauna Austr. 2:594

Male. Dorsum of thorax velvet-black; pleura sordidly yellow. Abdomen dark brown. Head black; antennae brown, with brown, shimmering whitish hairs; palpi yellow; legs whitish with dark articulations, last three joints of the hind legs brown. Wings shimmering milky white. Length .8 mm. Europe and Greenland according to Lundbeck (1898).

The male genitalia is shown on pl.32, fig.4 (after Kieffer).

2. *Corynoneura celeripes* Winnertz1852 *Corynoneura* Winn. Stett. Ent. Zeit. 13, 50, 31864 *Corynoneura* Schiner. Fn. Austr. 2:594

Female. Yellow; dorsum of thorax with three broad black longitudinal stripes, the laterals anteriorly abbreviated; pleura and metanotum blackish brown or black. Abdomen black with delicate, whitish incisures; venter sordidly yellow, blackened apically. Head black; palpi and antennae yellow, the apical joint of the latter brown. Legs whitish, with dark articulations, the last three joints of the hind tarsi blackish brown. Wings shimmering whitish. Length 0.8 mm. Europe and Greenland according to Lundbeck (1898). This species is supposed to be the female of *C. atra*. See Lundbeck (1898) and Kieffer (1902).

A single female specimen reared from a larva found in pond water (Ithaca, N. Y.) agrees with the above description, excepting that the pleura are yellowish.

Genus 26. *Wulpiella* Kieffer

Bul. Soc. Ent. France. p.66. 1899

Small species having 4-jointed palpi; antennae of female 6-jointed, the 4 intermediate joints verticillate with very long hairs. Tarsal claws simple; metatarsus shorter than its tibia. Wings hairy, the venation as in *Chironomus* (pl.34, fig.20). The type is *W. scirpi* Kieffer, an European species. No North American species.

In a note on p.824 of Ann. Soc. Ent. France (1900) the author states that in the figure given by him the crossvein has by mistake been omitted.

The larva is yellowish white, with dark head; length 4 mm. It has black eyes at the anterior angles of the head; a pair of short three-jointed antennae, mandibles four or five toothed, and a

seven to nine toothed labium. Thoracic and anal prolegs present, the latter with prominent retractile claws (fig.22). The caudal papillae are cylindrical, pointed apically, each with three short and three long setae. (Plate 34, figs. 21, 22, 23.)

Genus 27. *Limnophyes* Eaton

Ent. Monthly Mag. 60. 12. 1875. (Pl.37, figs. 1, 2, 3, 4)

Imago. Head small, ovately triangular; eyes roundly oval, hardly reniform; ocelli absent; antennae divergently porrect, filiform, 6-jointed, with sparse verticils of spreading hairs (fig.3), the basal joint very stout, the second much smaller than the first, but yet slightly thicker than the remaining joints, which are of even width, the apical joint as long as the preceding two together; mouth short, the margin hairy, palpi 4-jointed (fig.2). Thorax robust, above arched anteriorly and produced like a hood over the head (fig.4); its contour viewed from above is somewhat ovate, and it has about four longitudinal rows of short, fine, sparse hairs ascending upwards and inwards; scutellum moderately large, prominent, semicircular or roundly subquadrate. Wings oblong (fig.1), suddenly constricted at the base, rather straight along the costa, the apex almost parabolic, the margins ciliated. The subcostal vein very short, becoming obsolescent in the subcostal area, the radius two branched, R_1 extending beyond the middle of the costa, the media united by a crossvein to the radius just proximad of the point of furcation; R_{4+5} like R_1 , accompanied by a slight crease in the membrane; the cubitus rather deeply forked, the furcation acute, similarly accompanied by a crease which follows its lower branch; this last branch is succeeded by one or two longitudinal folds simulating additional veins (anal veins?). Halteres large. Legs slender, with fine short hairs; tibiae almost scabrous, with a minute spine at the apex interiorly; the first tarsal joint much longer than the next. Abdomen slender, 8-jointed, with a few hairs above; ovipositor formed of two very short lamellae. Larvae not observed.

In the original diagnosis it was stated that the number of joints in the palpi and abdomen were respectively 5 and 7. It appears to be more correct to regard them as being 4 and 8 jointed. The antennal joints are very likely to vary in number with the sex, and to be more numerous in the male than in the female.

The above description is copied from Verrall's paper in Phil. Trans. p.245, vol.168, only the nomenclature of the wing veins being changed. The figures 1 to 4 on plate 37 are also taken from Verrall, and illustrate details of the species *L. pusillus* Eaton, a small gnat found at Royal Sound, Kerguelen Island. No North American species.

Genus 28. *Chasmatonotus* Loew

Berl. Ent. Zeit. p.51. 1864

This genus is related to *Hydrobaenus* but differs from it in that the palpi are longer, and the flagellum of the antenna is composed of 5 joints in both sexes (i. e. antenna 7-jointed), see pl.31, fig.6. The dorsum of the thorax has a narrow fissure which widens posteriorly in a flat area in front of the scutellum (pl.31, fig.16); hence the name. The wings of our three American species are black with white markings.

KEY TO SPECIES OF CHASMATONOTUS

Imagines

- a* Wing with two prominent white spots (pl.27, fig.16): the larger near the base of the wing, the smaller subquadrangular, in the fork of the cubitus, a little distal of the middle of the wing (New York, Illinois)
 - 1. *bimaculatus*
- aa* Wing not marked in this way
 - b* Wing with a longitudinal vitta between the media and the cubitus; thorax black with front corners, and hind end, and a part of the pleura yellow; abdomen with posterior margins of the segments whitish (Alaska).....2. *univittatus*
 - bb* Wing with a broad transverse band extending from the radius to the posterior margin (New York).....3. *unimaculatus*

1. *Chasmatonotus bimaculatus* Osten Sacken

1877 *Chasmatonotus* O. S. Bul. U. S. Geol. Surv. 3:191

1878 *Chasmatonotus* O. S. Catal. Dipt. N. A. p.22

Male. Black; wings of the same color and with two large white spots. Length about 1.5 mm.

Black; thorax shining; base of the abdomen laterally pale greenish yellow; feet black; front coxae and base of all the femora yellowish; the first tarsal joints are of the same pale yellowish color except the tip, which is black. Knob of halteres greenish. Wings black; the first white spot is in the shape of a cross band between the second vein and the anal angle; second spot is square, and situated on the hind margin, within the fork of the cubitus, pl.27, fig.16, pl.31, figs. 6 and 16, pl.32, fig.6.

The first posterior cell and the cell within the fork of the cubitus are much longer than in *C. unimaculatus* Lw., and the latter cell is longer and broader. Hence it happens that although in both species the cross-band-like spot is placed immediately inside of the proximal end of the fork it occupies the middle of the wing in *C. unimaculatus*, and is much nearer the base in *C. bimaculatus*. The abdomen of the male ends in a comparatively large and conspicuous forceps (the "hypopygium maris globosum" in Mr Loew's description of *C. maculatus* seems to indicate a different structure?). (O. S. loc. cit.)

Catskill mountains and Quebec (Osten Sacken 1877). Several male specimens from Lake Forest, Illinois, received from Professor Needham. New Jersey (Johnson, 1904).

2. *Chasmatonotus univittatus* Coquillett

1900 *Chasmatonotus* Coquillett. Proc. Wash. Acad. Sc. 2:395

Male. Black; the bases of antennae, front corners and hind end of thorax, pleura, except the lower portion and one or two spots; halteres, trochanters, and bases of femora and of tibiae, yellow; posterior margins of abdominal segments whitish, mesonotum polished; abdomen subopaque; wings black, the extreme base and a vitta extending from it three quarters the length of the wing, between the medial and cubital veins, white; length 2.5 mm. Sitka, Alaska.

3. *Chasmatonotus unimaculatus* Loew

1864 *Chasmatonotus* Loew. Berl. Ent. Zeit. 50

1878 *Chasmatonotus* Loew. O. S. Catl. Dipt. N. A. p.22

Male and female. Black, with black wings, having a whitish spot on posterior margin. Length 2 mm.; wing 2 mm.

Head black, the eyes in both sexes separated by a wide shining front. Proboscis short, black; palpi black, four-jointed; the first joint short, the next two moderate, the second clavate; the third stouter; the fourth linear, a little longer than the preceding. Antennae fuscous black, short, in both sexes alike; the basal joint globose; the five joints of the flagellum short pilose, the first joint cylindrical, the three following short ovate, the last oval. Thorax black, the dorsum shining, the pleura opaque; scutellum the same color. Abdomen black, subopaque, the first segments in the female lurid; hypopygium of the male black, globose. Legs black, the bases of the femora sordidly yellow and the tarsi in immature specimens cinereous. Halteres black. Wings black, with a subtriangular white spot extending from the posterior margin as far as R_{4+5} of the wing. New Hampshire (O. S.)

Genus 29. *Telmatogeton* Schiner

Verh. zool. bot. ges. Wien. 16-931:1866

The larva and pupa have not been described as far as I am aware, but figures of both are given by Schiner (1868) of an East Indian species *T. St. Pauli* Schiner. These figures are reproduced on pl.34, figs. 12, 13, 14 and 15.

Imago. Head small and deeply set; the thorax highly arched, robust, rising abruptly behind the head; the abdomen is short and slender; the wings long and of uniform width, extending far beyond the abdomen; the legs are much elongated. Eyes oval, in both sexes widely separated by the deeply excavated front; the ocelli are wanting; palpi 4-jointed, the basal joint small, the following ones of equal length, thickly haired; antennae in both sexes alike, 7-jointed, scarcely as long as the head, the first joint extraordinarily large and thick, the second one slender, the next four disklike, much wider than long, closely joined, the apical joint elongated, somewhat thickened at the base, gradually becoming smaller towards the tip; the basal joint hairy above and below, the others bare. Metathorax strongly developed; the scutellum small; abdomen 7-jointed; male genitalia two-lobed, the lobes closely connected, not spreading or forceps-like; ovipositor of the female pointed; the upper sheath longer than the lower one. Legs long and slender, particularly the hind pair. At the end of each of the tibiae is a pair of short spines, and at the apical end of the metatarsus is a single one; the metatarsus is elongate the second joint scarcely one half as long as the first, the third less than two thirds as long as the second, the next two each half as long as the third; the claws horny, well-developed, furcate at the extreme tip; pulvilli small but well-developed; the empodium large, filling the space between the claws, ciliated at the apical end. Wings long, the anal angle right-angled, the posterior margin nearly parallel with the anterior margin; the subcostal vein running parallel to the costa but not reaching the margin; the cubitus forks proximad of the middle of the wing, its lower branch not quite reaching the margin, anal veins quite short (pl.34, fig.16). Halteres long with a broad knob. The type of the genus is *T. St. Pauli* Schiner (loc. cit.). A small blackish fly with dusky wings from the Island of St Paul in the Indian Ocean.

One species of this genus has been described from North America *T. alaskensis* Coq. (1900). The venation of the American species differs slightly from this description. See below.

***Telmatogeton alaskensis* Coquillett**

1900 *Telmatogeton* Coquillett. Proc. Wash. Acad. Sc. 2:395

Male. Head and its members brownish black, the front velvet black, first joint of antennae velvet brown; antennae about as long as the head, the first joint nearly three times as wide as the others, the latter subcylindrical, the last joint slightly longer than the others and subconical in profile; thorax opaque black, the lateral margins and upper part of pleura varied with yellowish, scutellum, metanotum, and abdomen brownish black, the lateral margins of the latter and hind margins of the ventral segments yellow; coxae mottled black, brown and yellowish, the remainder of legs blackish brown, front femora each bearing a transverse, contiguous pair of blunt tubercles near the tip of the under side, and just beyond them a pair of rather widely separated cavities; front tibiae each bearing a blunt tubercle on the under side near the base, the inner side of each front tibia rather strongly dilated at its first third; first joint of the tarsi nearly three times as long as the second; each of the last three joints slightly over one half as long as the second joint, claws cleft almost to the middle; halteres whitish; wings brownish gray, veins brown, first section of the media yellow, bases of the branches of the radius nearly coalescent; length 4.5 mm. Yakutat, Alaska.

This species agrees very well with Dr Schiner's description and figures except in the structure of the legs, but these are not sufficiently different to warrant the establishing a separate genus for the present form. Coquillett (loc. cit.) Specimens also from Oregon and California. In these specimens the cubitus forks immediately under the crossvein, the latter oblique, the subcosta reaches the wing margin slightly distad of Cu_2 . Length 4 to 6 mm.

Genus 30. *Macropeza* Meigen

Syst. Besch. 1:87. 1818. (Pl.35, figs. 1, 2, 3)

Small, blackish gray species, with long wings and extraordinarily long legs. Head small; transversely oval; the proboscis and palpi short, antennae 15-jointed; the second basal joint quite large and thick, the other joints peculiarly arranged, the first seven each small at the base and widened toward the end;

the next small, the following ones again, slender and elongate, the last one small; these are all only thinly haired (fig.3). The eyes round, bare, the ocelli wanting (or rudimentary?); front broad. The arching of the thorax gradually becomes greater from the head backward, the transverse suture wanting; scutellum short but wide; metathorax moderately large. Abdomen 8-jointed, hypopygium somewhat projecting. Legs long; coxae not elongated; the fore femora shortest, the posterior pair longest; tibiae without spurs; tarsi of the posterior pair of legs extremely slender, and at least as long as the femora and tibiae taken together, the metatarsus about twice as long as the following joints taken together, apical joints small, the sole of the clawed joint bristly, the claws quite long and bent; the halteres prominent. Wings long and narrow; venation as shown in figs. 1 and 2. The first figure is from V. d. Wulp (1877) the second after Meigen (1818). No North American species have been described.

Genus 31. *Hydrobaenus* Fries

Vetensk. Akad. Handl., 1829. 176. 1830

Psilocerus Ruthe, Isis. XI. 1207. 1831

(Pl.34, figs. 2 to 11)

Fries (1830) describes the larva and pupa at considerable length and gives figures illustrating details of each; the latter are reproduced on pl.34, figs. 2 to 5 and 8.

Larva. The larva is described as being 4 mm. in length, greenish in color, quite slender, and cylindrical. The head (fig.2) is small, obcordate and black. The antennae are three-jointed. On the ventral side of the first thoracic segment is a pair of feet with setae (fig.3). On the dorsal surface of the eleventh abdominal segment are two cylindrical processes, the extremity of each with a tuft of long hairs. On the ventral surface of this segment are the blood gills, two in number and shorter than in *Chironomus*. The twelfth segment has the usual anal feet and four blood gills, the latter, however, differing from *Chironomus* in having at the apex of each a little tuft of hairs.

Pupa. (Figs. 5 and 8) Thorax with short and narrow respiratory tubes. The caudal end is provided with two tufts of long hairs. The species shown by Fries is *H. lugubris*, an European species.

Imago. Very small black species, the males as well as the females of which have the antennae with short hairs. Head small,

flattened in front; epistome somewhat prominent; proboscis not much extended; palpi short, four-jointed, the last joint somewhat longer than the one which precedes it; antennae of the male 14-jointed (fig.7); the basal joint thick, the last joint elongated and thicker than the rounded preceding joints, short and sparsely haired; the female with a 7-jointed antenna (fig.6), the first and last joint as with the male. Eyes crescent-shaped, the concave side enclosing the antennae, bare; ocelli wanting. Mesothorax produced over the head, well arched; abdomen narrow and long, 8-jointed, hypopygium small (figs. 10 and 11). Legs moderately long, covered with fine, woolly hair; the metatarsi somewhat elongated but not as long as the tibiae; claws distinct, puvilli very small. Wings shorter than the abdomen and with the cell M_1 open; anal angle rounded (fig.9). Halteres free. Fries' figure (copied on pl.34, fig.7) shows the male antennae with but 13 joints, although the description says there are 14.

This genus has not yet been recorded from America.

Genus 32. *Doloplastus* Skuse

Proc. of Linn. Soc. of N. S. W. 4:260. 1889

Antennae 2-6 jointed in male, otherwise as in female of *Orthocladus*. Wings naked. Third longitudinal vein (R_{4+5}) nearly straight. Costal vein extending a little beyond tip of third longitudinal (R_{4+5}). Posterior branch of fifth longitudinal (Cu_2) straight. Legs unicoloured. In fore legs the metatarsus considerably shorter than tibia. Forceps of male robust. An Australian genus.

Genus 33. *Smittia* Holmgren

Kongl. Svenska. Vetensk. Ak. Handl. Bd. 8. no.5. 1869. 47

Front wide, eyes oval, somewhat prominent, at the base of the antennae slightly emarginate. Antennae short, flagellum (female) sparsely haired, 5-jointed (i.e. antennae therefore 7-jointed), the first and the last joint longer than the others. Oral margin slightly produced, palpi rather stout. Thorax like that of other *Chironomids*. Abdomen somewhat blunt, the tip on both sides with a seta-like tubercle. Wings narrow, short, scarcely reaching the middle of the abdomen; venation much as in *Chironomus*, but more difficult to distinguish; stouter towards the costal margin. Legs rather long, fore femora stouter, the tarsi a little longer than the tibiae. This genus takes a position between

Dia mes a and *Chir on om us*, but easily distinguished from them by the short wings. Type of the genus *S. brev ip en nis* (= *Chir on om us brev ip en nis* Bochem).

It is not stated in the description whether the wings be hairy or bare. From the statement that the tarsi are a *little* longer than the tibiae, it appears that the metatarsus is shorter than the tibiae. The genus may, therefore, be most nearly allied to *Orthocladius*, *Camptocladius* or to *Metriocnemus*. In the description given by the author in Ent. Tidskr. p.181, 1883, it is stated that the abdomen of the male is narrow and the anal end somewhat thickened almost like that of *Dia mes a*. Genus has not been recorded from America.

Genus 34. *Burmeisteria* Weyenbergh

Tidj. v. Entomol. 130. 1886. (Pl.35, figs. 26-28)

Like *Chir on om us*, but the thorax is narrowed anteriorly and bent downward overhanging the head (fig.27). The halteres are long and flat (fig.28), the stem very short, hence covered by the knob. Wings with ciliated margin (fig.26).

In the generic description given by Weyenbergh the number of antennal joints is not stated; although the statement "like *Chir on om us*" would seem to imply that this genus possesses the same number as *Chir on om us* (i. e. 14). Weyenbergh's figure also shows about this number. Arribalzaga (1893 p.241) states that the genus should be regarded as a synonym of *Chir on om us* sens. str. and further says that the wings are bare.

The type of the genus is *B. photophila* Weyenb. (loc. cit.), recorded from Argentina. No other species have been recorded.

Genus 35. *Diamesa* Meigen

Syst. Besch. 7:12. 1838. (Pl.30, fig.13, and pl.32, figs. 5 and 14)

Larva. The larvae of the known species are yellowish or greenish in color and are found in swiftly flowing water. In form they are of the usual *Chironomid* type, most resembling those of *Orthocladius*. The blood gills of the eleventh abdominal segments, which are usually found in *Chir on om us* are wanting in this genus; their absence probably due to the fact

that the larvae are found only in well aerated water. When taken from the streams and placed in still water they soon die, usually within a few hours. (Pl.36, fig.14-25, after Heeger; 1853; and pl.20, fig.9).

Pupa. The pupae are apparently without thoracic breathing organs; if they are present they must be extremely minute and have been overlooked. The anal end with 6 or 8 short setae; the posterior margin of each abdominal segment with spines or setae. (See pl.48, fig.13, in Bul.68, N. Y. State Museum, '03.)

Imago. Head small; broad and flattened in front, the face prolonged into a short broad proboscis; eyes elongate, only a little emarginate, ocelli wanting. Antennae inserted close to the eye margin, 14-jointed in the male, basal joint broad and disk-like, the fourteenth very much elongated like that of the males in *Chironomus* and of a similar structure; densely plumose; antennae of the female seven or eight jointed (pl.31, fig.7), the joints rounded or oval, the last one somewhat longer and cylindrical. In both sexes the basal joint disk-like. Palpi four-jointed. Thorax highly arched; produced more or less over the head, slightly flattened in front of the scutellum. Abdomen like that of most *Chironomids*; rather long and slender in the male; shorter and stouter in the female. Legs long and rather stouter than in *Chironomus*, fore metatarsus equal to or shorter than the tibia; the fourth tarsal joint, of most species at least, short, obcordate. Wings bare, venation as shown on pl.30, fig.13, resembling *Tanyptus* in having the M-Cu crossvein; the subcosta slender, but distinct, R_1 and R_{4+5} ending in the costa; between these is the slender and delicate R_{2+3} ; the media is simple; the R-M crossvein oblique; the M-Cu crossvein erect; the cell M is present; the cubitus forks a little before the M-Cu crossvein; the humeral crossvein is present. Genitalia as shown on pl.32, figs. 5 and 14.

Several species have been recorded from Europe and North America. Haliday in Walker's *Ins. Brit.* III (1856) has recorded species the males of which are said to have bare or short-haired antennae.

KEY TO SPECIES OF DIAMESA

Larvae

- a* Mouth parts as shown on pl.20, fig.9.....1. *waltlii*
aa Mouth parts as shown on pl.36, figs. 18 to 25; the dorsal surface of the abdominal segments marked with transverse fasciae (European species)3. *culicoides*

Pupae

- a* Anal end with six slender filaments.....1. *waltlii*
aa Anal end with eight filaments.....3. *culicoides*

Imagines

- a* Halteres pale yellow; thoracic stripes black; length 4.5 to 5 mm. (United States, Europe, Greenland).....1. *waltlii*
aa Halteres white; thoracic stripes cinereous black; length 2.75 to 4.25 mm. (Greenland)2. *chorea*

I cannot separate *aberrata* Lundbeck (1898) from *waltlii*.

1. *Diamesa waltlii* Meigen

1838 *Diamesa* Meigen. Syst. Besch. 7:13. 1

1856 *Chironomus* Halid. in Walk. Ins. Brit. Dipt. 3:194

1864 *Diamesa* Schiner. Fauna Austr. 2:615

1898 *Diamesa aberrata* Lundbeck. Vidensk. Meddel. 289. 77

Larva. (Pl.20, fig.9) The larvae were taken in company with the larvae of *Thalassomyia fusca* among the algae on the surface of rocks over which the water flows rapidly. In color it is pale green, in general appearance and even in many details of structure it greatly resembles *Thalassomyia fusca*. The dorsal sclerite of the head is elongated, shield-shape, with two pairs of marginal setae; on the lateral sclerite there is one seta near the base of the mandible just above the lateral line, one pair below this one and a little cephalad; another pair about one quarter of the length of the head caudad of these but lying as far below the lateral line as the first is above. Directly caudad of the first, but midway between the front and hind margin of the head, is another; close to the dorsal suture, one quarter the length of the head cephalad of the caudal margin is still another; and finally there is a single one on each side at the base of the labium.

The mouth parts are as shown in the figure. The epipharynx is shown with its parts extended. In the figure given by the writer in Bul. 68, N. Y. State Museum (1903) these parts are shown folded down. The lateral arms (*la*) are each expanded apically into a handlike process with 7 or 8 fingers. The mandibles each have 5 blunt teeth, a fringe of coarse-branched hairs projecting mesad, and two stout setae on the dorsal surface near

the base. The labium (1) has about 19 blunt teeth; the antennae are of moderate length, bare, and with three terminal appendages. The entire body appears to be devoid of hairs. The thoracic and anal feet are of the usual *Chironomus* type. The dorsal tuft of the anal segment is present; blood gills of the eleventh segment absent.

Pupa. The pupa is fuscous in color, with a slightly greenish tinge. Thoracic respiratory organs apparently wanting. On the dorsal posterior margins of each of the abdominal segments, excepting the first and last, there are 10 to 12 short, stout caudad projecting teeth, the two or three lying nearest the lateral margin being smaller than those near the median line; and on the ventral surface of the segments, excepting the first, second and last, there are six or eight stout teeth projecting cephalad. At the anal end there are three pairs of short hollow filaments which may have a respiratory function. The length of pupal life is about two days.

This pupa greatly resembles that of *D. culicoides* as described by Heeger (1853) excepting that there are eight abdominal filaments in the latter while there are but six in the former.

Described from specimens taken in Cascadilla creek, Ithaca, N. Y. An empty pupal skin from Las Vegas, New Mexico, from Professor Cockerell does not differ from the one described above.

Male. Black; head black, including eyes, mouth parts and antennae, the latter densely covered with long, dark brown hair. Its first joint enlarged, disk-like, the second twice as long as broad, the following 11 a little shorter than broad, the 14th longer than all the rest taken together. The palpi are somewhat shorter than the antennae, four-jointed (besides a small basal piece), the first joint shorter, the fourth longer than the other two. Dorsum of the thorax black, subshining, with a faint cinereous bloom covering the surface, excepting the three slightly raised longitudinal stripes, which are deep black, and between which are arranged some scattered black setae; scutellum dark brown, with black setae; metanotum and pleura black, the latter with a gray bloom; abdomen black, longer than the wings in fresh specimens, covered with fine brown hairs, posterior margins of the segments narrowly cinereous. Genitalia conspicuous and rather complex (pl.32, fig.14); the apical joint of the appendages triangular in outline with a sharp point; the basal joint with a pointed process attached near its base on the inner side, mesad of which are two smaller pointed projections. The dorsal keel is nearly straight and spike-like. Legs uniformly fuscous, all the fourth tarsal joints shorter than the fifth, tarsal

claws simple. Wings broad, and nearly as long as the abdomen in fresh specimens; usually longer than the abdomen in dried specimens; cinereous in color, the anterior veins conspicuous, brownish or black; media and cubitus pale, posterior margin very delicately ciliate. Halteres usually pale, in an occasional specimen brownish, the knob triangular in outline. Length 3.5 to 5 mm. (pl.30, fig.13).

Female. Cinereous black, front and epistome cinereous, eyes but slightly excavated at base of antennae; palpi and antennae fuscous, the latter with 8 joints counting the disk-like basal joint, short-haired (pl.P, fig.7); scutellum hemispherical, dark brown, with black setae; abdomen fuscous with short brown hairs, posterior margins to the segments darker except on the extreme edge, which is pale yellow; genitalia small, brown and leaf-like; legs fuscous; claws simple; wings broad, and longer than the abdomen; anterior veins black; media and cubitus pale; length 3.5 to 5 mm. In other respects like the male. Described from bred and captured specimens. New York, Idaho, Washington State, Greenland.

Fitch's *Chironomus nivoriundus*, which I formerly considered a synonym of *Diamesa waltlii* Meig., I now regard as distinct.

According to Lundbeck (1898), *D. waltlii* does not possess cilia on the posterior margin of the wing, he quoting Meigen as authority for this statement; the European specimens, however, which I have do possess these cilia, as do also my American specimens. The cilia are quite short and rather difficult to see with a hand lens. *D. aberrata* Lundbeck (1898, p.290), according to its author, differs primarily from *D. waltlii* in possessing cilia on the posterior margin of the wing; but since *waltlii* does have the cilia, this distinction fails, and the two names must be regarded as synonymous. In the description of *aberrata* the scutellum and legs are said to be pale brown, while in *waltlii*, as described above, they are dark brown or fuscous. These differences are at most only varietal in character; and furthermore, in immature specimens these parts are usually somewhat paler than in mature specimens.

2. *Diamesa chorea* Lundbeck

1898 *Diamesa* Lundbeck. Vidensk. Meddel. 291

Greatly resembling *D. aberrata* Lundb.; its smaller size, obscure coloring, white halteres and more slender legs will distinguish it.

Male. Thorax cinereous, with three cinereous black stripes, the two laterals anteriorly abbreviated, the interval between sparsely hairy, scutellum cinereous brown, pilose, metathorax cinereous-black, the pleura gray, the pectus cinereous-black. Abdomen slender, cinereous-black with yellow hairs, the venter paler, the anal segments wide. Antennae brown, 14-jointed, plumose. Legs more or less dull brown, slender, setose. Halteres white. Wings slightly tinted, nearly hyaline, the margin short ciliate, the venation like that of *D. aberrata*. The fourth tarsal joints shorter, or at least not longer than the fifth; the fore metatarsus is somewhat shorter than the tibia.

Female. Antennae 8-jointed, short, the last joint elongate, fusiform, the abdomen shorter and stouter than that of the male; differs from the female of *D. aberrata* in its smaller size, shorter antennae, and wholly cinereous abdomen. Length of male and female 2.75 to 4.25 mm. Greenland. Translation.

3. *Diamesa culicoides* Heeger

1853 Sitzb. K. K. Acad. Wiss. Wien. 10:7

The larva, pupa and adult of this European species were described by Heeger (1853). Heeger's figures are reproduced on pl.36, fig. 15 to 25.

According to this author 80 to 100 eggs are laid by the female in groups of 10 or 12 upon stones or other objects along banks of the brook where they may be washed by the water from time to time. The eggs are described as being yellowish-white, nearly cylindrical, slightly smaller at one end, scarcely .25 mm. in length and nearly one-half as wide. The larvae emerge in about 8 or 10 days. They are white in the beginning; later the dorsal surface becomes brownish. When full grown about 12 mm. in length. The eyes are subtriangular, small, flat and black; the labrum is rounded, brownish-yellow, chitinous, scarcely one-sixth as broad as the head, one-half as long as broad, with four rounded teeth. The lower lip is one-half as broad but twice as long as the labrum, pale yellowish, truncated anteriorly, with the anterior margin densely hairy; the palpi are attached basally to this, and have the same structure as the lower lip. The labium is dark brown, is one-fourth as broad as the head, with a semi-circular anterior margin, this margin provided with six very short rounded teeth on each side, and in the middle with a broadly truncated one (fig.19); the mandible (fig.18) is subcordate, one-fourth as long as the head, with five short rounded teeth, proximal of which there is a long row of yellowish brown, movable setae. The larva spins a thin, tube-like dwelling from which the head

projects when it is watching for prey. There are three moults. They are found where the water is swiftest.

The pupae greatly resemble those of the Tortricids, are nearly cylindrical, slightly pointed at the apical end, smaller posteriorly, and of a pale brown color, somewhat darker anteriorly (pl.36, figs. 16 and 17). The abdominal segments are provided with setae; those on the dorsal surface projecting caudad, those upon the ventral surface projecting cephalad. The anal end has 8 slender, long, chitinous setae, the apical end of which is bent upwards. The adult is also described, but since it is not an American species, the description will not be reproduced here.

Genus 36. *Eutanypus* Coquillett

Fur Seals and Fur Seal Islands. 4:341. 1899

Closely related to *Tanypus*, but the antennae of the female are 8-jointed, of the male 9-jointed, not plumose, the first joint bulbous, about three times as broad as the second; joints two to seven in the female, two to eight in the male, decreasing in length outwardly, the penultimate joint only slightly longer than broad, the ultimate nearly as long as the three preceding joints; eyes deeply emarginate next the antennae, palpi four-jointed. Third vein of the wing simple, fourth issuing from the fifth near its base and forking near the middle of the wing, the fifth also forking near the middle of the wing, its upper branch connected with the fourth by a crossvein; small crossvein and first section of the third vein scarcely longer than broad. Type of the genus *E. borealis* Coq. loc. cit.

It appears from this description that the wing venation must greatly resemble that of *Diamesa*, the number of antennal joints and the lack of long antennal hairs distinguishes the male of the genus from *Diamesa*. The females of *Eutanypus* cannot be distinguished from those of *Diamesa*. The third vein spoken of in the above description appears to be R_{2+3} ; the anterior fork of the fourth seems to be equivalent to R_{4+5} , and the posterior fork the same as the media; the fifth is the same as the cubitus. Compare the figure on pl.36, fig.13.

Eutanypus borealis Coquillett

1899 *Eutanypus* Coq. Fur Seals and Fur Seal Islands. 4:341

Female. Head black, opaque gray pruinose, the antennae, palpi, and proboscis brownish black, the antennae nearly twice

as long as the head. Thorax, scutellum, and abdomen black, opaque gray pruinose, the sparse hairs chiefly yellow. Wings 1.5 times as long as the abdomen, whitish hyaline, veins yellow or brownish; the third, except at its base, the fourth before its point of furcation, also its posterior branch, both branches of the fifth and the whole of the sixth almost colorless; the crossvein at the outer end of the second basal cell unites with the upper branch of the fifth a short distance beyond its base, and with the fourth a short distance before its furcation; the small crossvein at about twice the length of the outer crossvein beyond the base of the upper branch of the third¹ vein; the first vein extends to the last fifth of the length of the wing. Legs brownish black, first joint of the front and the hind tarsi two-thirds as long as their tibiae, the fourth joint noticeably widened, about three-fourths as long as the fifth; tarsal claws simple and of equal length. Halteres yellow. Length 3.5 mm. Bering Island.

An immature male specimen collected at the same time and place differs from the female in having the palpi, antennae, scutellum and the legs yellow. A female collected on the summit of Mt Washington, N. H., by Mrs Annie T. Slosson, does not differ from the female above described. (Coquillett, loc. cit.)

The description given above of the female would apply very well to *Diamesa waltlii*.

Group *Chironomus* Meigen

Meigen, Illiger's Magazin. 2:260. 1803

The eggs. The eggs of the members of this group are deposited, usually in the water, in the form of a long string or in a clump, surrounded by a layer of gelatine. The arrangement of the eggs within the egg string seems to be constant for a given species (pl.31, figs. 12 to 15). Miall and Hammond (1900) say, "In *C. dorsalis* the egg mass is a transparent cylinder with rounded ends, about 20 mm. long, formed of a mucilage secreted by the gluten-gland, in which the brownish eggs are imbedded. The eggs do not lie at random, in the cylinder, but are lodged in a special winding tube or egg-pipe, which lies near the surface of the egg mass, and makes many almost complete spires, curving around from right to left and from left to right alternately (pl.31, figs. 13 and 14). The tube itself only becomes visible when the egg

¹This should probably read "4th vein", because in the generic description the third vein is said to be simple; i. e. unbranched.

mass is boiled or treated with hardening agents. The interior of the cylinder is traversed by interwoven cords. As many as 19 spires have been counted in one egg mass and since each spire commonly contains about 45 eggs, the total may amount to 850 or even more."

In an undetermined North American species observed by the writer, the egg mass is in the form of a clump enveloped in gelatine, which is moored by means of a cord to a stone or a weed along the bank of a pool. The eggs within this clump have no definite arrangement but lie at random (fig.10). Another North American species lays a string in which the eggs are arranged as shown in fig.15, and still another as shown in fig.12.

Larva. All the larvae of the members of this group are rather slender, have a rather short head, and possess thoracic and anal prolegs (pl.16). In size the mature larvae vary from 4 or 5 mm. to upwards of 25 mm. Many of the largest species are blood red in color, while the smaller ones are yellow, light or dark green, brownish, or pink. The head is small, brownish in color, heavily chitinated, and a little longer than wide. The sclerites of the head consist of a dorsal, ventral, and two lateral plates, besides a number of smaller ones. The dorsal sclerite is elongate shield-shaped, often with a few setae. Attached to the front margin of this plate is the labrum, which hangs flap-like in front of the mouth and may be bent backward; and on the under surface are several pairs of setae, usually pectinate. Attached to the ventral surface of the labrum is the epipharynx. This is a rather complex structure; it is attached at its anterior margin, its free margin projects ventrad and caudad. Its form varies in the different genera. The lateral plates bear two pairs of rudimentary eyes (pigment spots) as well as the antennae and the jaws. The antennae (pl.16, fig.5, and pl.22, fig.1a) are situated on the anterior end of the lateral plates; they consist of a comparatively long basal joint and several shorter terminal ones. The mandibles (pl.22, fig.1, md) situated ventrad of the antennae are stout and have a four or five toothed margin. They are articulated in such a manner that they move in an oblique plane, striking the labium (pl.16, fig.5). The labium is attached or rather is coalescent with the front margin of the ventral sclerite of the head, the suture separating

the sclerite from the lateral ones only faintly marked. Miall and Hammond (1900) consider the ventral piece as a portion of the lateral sclerite. The margin of the labium is toothed (pl.22, fig.1 l); the size and arrangement of the teeth vary in the different species. Near the base and ventrad of the mandibles are the maxillae (fig.1 mx) consisting of fleshy processes, with a short cephalad projecting palpus (fig.1 p), and some setae and papillae. On each side of the labium is a striated and flexible fan-shaped flap which helps to close in the mouth. On the floor of the mouth cavity, lying close to the labium, is the hypopharynx (fig.1 hy), with various setae and papillae. The prothoracic pair of feet is furnished with a large number of slender, curved hairs, sometimes pectinate, the two feet very close together so that they appear almost as one (pl.21, fig.8). The first three segments of the body in specimens which are ready to transform are enlarged and represent the thorax; the intermediate segments of the abdomen are subequal in length and usually have a few setae. On the ventral surface of the eleventh segment of those species which are blood red in color there are two pairs of long blood gills (pl.16); on the caudal end of the dorsal aspect of the last segment are two small papillae each surmounted by a tuft of a few long hairs; ventrad of these there is a bunch of four short blood gills. The anal feet are about as long as the eleventh segment, each one with a crown of from 10 to 20 bifid claws (pl.21, fig.9).

Pupa. The pupa is somewhat elongate, the thorax enlarged, and the abdomen 8-segmented, not counting the anal appendages (pl.16 and pl.23, fig.9). Upon the cephalic end of the thorax are the respiratory organs, which may consist of a pair of much branched filaments, or a pair of tubes or knobs, or may be entirely wanting. On the abdomen there are frequently a few lateral filaments, and at the caudal end of the lateral fins of the eighth segment there is often a chitinized comb or spur (pl.22, figs. 8 and 26) with a variable number of teeth depending upon the species. Usually the dorsum of each abdominal segment is marked by a large number of short and very minute setae arranged in some constant pattern for a given species (pl.22, figs. 3, 12, 13, 14, 15). The ninth or anal segment may be provided with a fringe of matted hairs, forming a paddle, or may have only a few characteristic setae.

Imago. Rather large to very small species, characterized by the structure of their antennae and the wing venation. Head small, somewhat compressed laterally; epistome somewhat prominent, and usually hairy; proboscis short; palpi incurved, four jointed, the last joint somewhat elongated. Antennae of the male 14-jointed, the first joint large, disk-like; the second cylindrical, the following ones rounded and closely crowded, the last joint very long, often as long as the others taken together; all long plumose; that of the female 7-jointed, the first disk-like, the second cylindrical, the following egg or pear-shaped, short verticillate, the last one cylindrical or ellipsoidal, short-haired; eyes reniform, ocelli are wanting. Mesothorax highly arched, projecting over the head, without transverse suture, with a depressed area in front of the scutellum; the pectus deeply arched, scutellum small; metanotum well developed. Abdomen long and narrow, compressed cylindrical, 8-jointed; hypopygium tong-like. Legs very slender and long, especially the anterior pair, which are widely separated from the following pairs; coxae elongated, the tibiae sometimes very short, and the metatarsi often much elongated, the vesture woolly and short, sometimes fringe-like; claws and pulvilli present. Wings long and slender, hairy or bare, folded over the abdomen when at rest; in the male often shorter than the abdomen. Venation as in the figures on pls. 28, 29, 30, and 31; anal angle present; the halteres free.

Van der Wulp (1874) divided this group into a number of genera, using as characters for the subdivisions the relative length of the fore tibia to the metatarsus, the condition of the wing, i. e., whether hairy or bare, and the course of the cubitus. Descriptions of these genera are given on subsequent pages.

Genus 37. *Thalassomyia* Schiner

Verh. zool. bot. Gesell. 6:218. 1856

This genus was erected by Schiner (loc. cit.) to contain the species *T. frauenfeldi*, of which only the female was known. More recently Dr Tömösvary (1884) described another species *T. congregata*, and in 1903 the writer described the male and female of a third, *T. obscura*. Coquillett (1902) described a fly which he called *Orthocladus*

platypus from Arizona and which probably also belongs to this genus, making four species thus far known.

The eggs of *T. congregata* are laid in strings of gelatine, in which the elongate oval eggs are placed. The larvae of the two species of which they are known live in rapidly flowing water. Here the larva spins upon the surface of the rock a cocoon so loose, transparent, and open that it is not hidden by it, though it prevents the larva from being washed away. The larva greatly resembles *Diamesa* from which the one American species which is known in the larval state can be distinguished by the form of its labium. The larva is pale green in color with a dark brown head, and without blood-gills on the ventral surface of the eleventh segment. The pupa is apparently without thoracic respiratory organs; and the dorsal surface of the abdomen is provided with numerous setae.

Imago. The genus resembles in many respects both *Orthocladus* and *Diamesa*; from the former it may be distinguished by its having the fourth tarsal joint of all the feet in both sexes obcordate and shorter than the fifth; from the latter genus in having no M-Cu. crossvein (pl.30, fig.12).

Head small, broad, eyes elongate, somewhat emarginate, ocelli wanting. Antennae 14-jointed in the male, long, densely haired, the 14th joint like that of *Chironomus*; antennae of female 7-jointed, sparsely short-haired, joints rounded, basal joint of both male and female flattened, disk-like. Palpi 4-jointed. Thorax arched. Abdomen of the male moderately slender, of the female shorter and stouter. Legs moderately slender, fore metatarsus shorter than the tibia, the fourth tarsal joint of all the feet in both sexes shorter than the fifth and obcordate. Wings bare, venation resembling that of *Orthocladus*, the M-Cu. crossvein wanting. The forking of the cubitus may be either proximad or distad of the R-M crossvein.

KEY TO SPECIES OF THALASSOMYIA

Imagines

a Dorsum of thorax blackish with indications of three stripes; humeral spots, scutellum, and pleura yellowish or brownish; abdomen dull black, first two segments greenish; length 3 to 5 mm. (New York)

1. *obscura*

aa Thorax black, humeral spot yellow; length 2.5 mm. (Flagstaff, Arizona)

2. *platypus*

1. *Thalassomyia obscura* Johannsen1903 *Thalassomyia* Johannsen. N. Y. State Museum bul. 68. 437

Larva. The eggs were not found. The larva is 8 to 10 mm. in length when full grown, pale or yellowish green in color, its head is dark brown and heavily chitinized. The head is somewhat longer than wide, the dorsal suture well marked. Two setae are placed immediately in front of the transverse suture, and at the apical end of the labrum are two more. The lateral arms of the ventral surface of the labrum are rather short and stout, and somewhat pointed. The anterior ventral margin of the labrum is provided with short fleshy filaments instead of setae as is usually the case in *Chironomus*. The antennae are small, the basal joints about four times as long as wide, each with two terminal pieces, one of which is four-jointed, the other simple. The mandible is about twice as long as broad, with five blunt teeth; articulated at the base is a long slender process with four terminal spines. The maxillae are short protuberences, covered with pointed projections, with a very short palpus with its terminal papillae, and two stout setae projecting ventrad. The hypopharynx is tongue-like, with two long basal pieces. Its apex and its dorsal surface are covered with pointed papillae; ventrally there is an open arched rib. At the cephalic end of the ventral sclerite, and coalescent with it, is the labium, with 11 blunt marginal teeth, the middle one wide and broadly truncated. On the prothoracic segment are the two prolegs, each with about 30 long curved spines, and a number of short and very small spines on the ventral surface. At the base is a single slender seta, on each side a little dorsad of the lateral line are two more, and caudad of these and below the lateral line a group of three. The eleventh segment is without blood gills; the twelfth with two comparatively short legs, each with a crown of 8 to 10 bifid claws; on the dorsal surface are two small protuberences upon each of which is a tuft of five or six long setae. Between the legs and projecting caudad are four short blood gills.

Pupa. The pupa is about 4.5 mm. long, with the colors of the adult. It is much shorter in comparison to its breadth than is *Chironomus*. The wings extend to a little beyond the posterior margin of the second abdominal segment. Eight segments are present besides the short anal segment. On the dorsum of each segment, toward the caudal margin, is a transverse band of stout black bristles. Each band is composed of five or six rows. The most caudad of these rows contain the longest bristles. The anal segment is composed of two small lobes, each with a single apical bristle. After two to four days of pupal life it transforms into the imago. (See pl. 50 in N. Y. State Mns. Bul. 68.)

Imago, male. Front and epistome yellow, palpi fuscous, shorter than the antennae, its first joint about 1.5 times as long as broad, the second twice, the third three times and the fourth four times as long as the first. Antennae fuscous, 11-jointed, the first disk-like, the second longer than broad, the third to the thirteenth about as long as broad, the fourteenth longer than all the others taken together; all furnished with long brown hairs except the apical one-fourth of the fourteenth. Dorsum of the thorax blackish; yellow on the humeri and pleura, covered with a white bloom, most conspicuous on the humeri. The dorsum of the thorax has a dirty yellow ground color, but the three black longitudinal stripes are so wide that only a little of the ground color shows, excepting on the humeri and the two very narrow faint longitudinal stripes separating the three wide, black ones; the scutellum is chestnut; metathorax black; pectus brown; abdomen dull black, the dorsum of the first two segments greenish; the extreme edge of each segment, paler fuscous; the venter greenish, darker, almost black on the more posterior segments. The green is sharply separated from the dorsal color on a lateral line. In dried specimens this green color becomes dusky; legs almost black, the coxae and the bases of the femora yellowish, fore tarsi only pubescent, not hairy; fore metatarsus about three fourths as long as the tibia; tarsal claws simple; wings hyaline, hairless, the anterior veins yellowish, the rest hyaline, venation as in fig. 12, pl. 30; anterior and posterior margins delicately ciliate; genitalia inconspicuous. Halteres white. Length 3 to 5 mm.

Female. Antennae seven-jointed, black, with short hairs. Thorax with black stripes a little narrower than in the male, hence the yellow stripes separating them and those on the humeri more conspicuous. Pectus, scutellum, and a little space in front of the latter brown; the pectus in dried specimens sometimes nearly black; pleura yellow, metanotum black; abdomen as with the male, but the venter is paler; legs black, coxae and bases of femora yellow; tarsal claws simple; wings hyaline, anterior margin and tip a little dusky; anterior veins yellow; wing margins delicately ciliate; venation as with the male; halteres white. Length 3 to 5 mm. Many captured and bred specimens. Ithaca, N. Y.

2. *Thalassomyia platypus* Coquillett

1902 *Orthocladus* Coquillett. Proc. U. S. Nat. Museum. 25:93

Black, a large dull yellowish humeral spot, halteres, trochanters, and extreme bases of femora yellow; hairs of antennae dark gray, thorax opaque, grayish pruinose; tarsi only pubescent, the fourth joint dilated, emarginate at the apex, noticeably shorter than the fifth, first joint of front tarsi three fourths as long as the tibiae;

wings hyaline, small crossveins not darker than the adjacent veins, not clouded with brown, third vein beyond its middle slightly bowing toward the costa; length 2.5 mm. Male. Flagstaff, Arizona. New Jersey (Johnson).

Thalassomyia frauenfeldi Schiner

Theobald in "An Account of British Flies," p.202, reproduces a note of Mr Swainson, which reads in part as follows:

" . . . I found this larva several times on *Ohelia* zoophytes growing at the end of St Anne's pier. Next I found it on some *Coryne* from the Mumbles (Swansea) and more recently I dredged it from fifteen fathoms off Spanish Head (Isle of Man) adhering to seaweed. Professor Miall, of Leeds, to whom I sent specimens, thought it would ultimately turn out that Johnston's *Compositia* was Schiner's *Thalassomyia frauenfeldi*. This seems very possible, as the descriptions are very similar. . . "

The figure given by Theobald (1892) is reproduced on pl.34, fig.1.

Genus 38. *Chironomus* Meigen

Hiliger's Magaz. 2:260. 1803. (*Chironomus*, part)

Larva. The larvae of this genus differ from those of the other genera of the group *Chironomus* primarily in the form of the mouth parts, and are known as bloodworms; some species, however, have pale larvae. The antennae are short, with the first joint nearly twice as long as the remaining four taken together. Set on the end of the first joint, there is, besides the second joint an unsegmented appendage. On the under surface of the labrum are several pairs of setae and sometimes a pair of fan-shaped organs, perhaps sense-organs. The epipharynx is well developed, and on each side of it is a long chitinized, sickle-shaped process, which are called the lateral arms in the following descriptions (pl.22, fig.10 la. and pl.23, fig.10 lb). At the anterior margin of the epipharynx is a minute comb with caudad projecting teeth (pl.23, fig. 10 c); caudad of these is a horseshoe-shaped piece with the open end projecting cephalad (fig.10). Within this arch are several curved pectinate setae, which may be erected, though they are usually folded down as shown in the figures. The maxilla has, besides the rather prominent palpus, some cephalad projecting filaments on the outer lateral margin and a number of setae, papillae and filaments on the inner margin (pl.22, fig.1 mx). The eleventh abdominal segment has usually though not always two pairs of blood gills besides those on the twelfth segment.

Pupa. The pupa usually remains within the tube constructed by the larva, but is capable of swimming freely like a frog larva. It is provided with a pair of much branched thoracic filaments, and its caudal segment is fringed with long matted hairs or filaments forming a paddle (pl.23, fig.9 f).

Imago. The genus *Chironomus* as restricted by Van der Wulp (1874 and 1877, p.245) is defined by him in the latter work as follows: Face usually hairy, lengthened downward snout-like; proboscis short, palpi bent, 4-jointed, the last joint elongated. Antennae filiform, in the male 14-jointed, the first joint short, disk-like, the second cylindrical, the following rounded, closely sessile, the end joint very long and slender, all long and densely plumose; toward the tip the hairs become gradually shorter; in the female the antennae are much shorter, 7-jointed; the first joint short, disk-like, the second cylindrical, the following four oval, sparsely haired, the last joint somewhat elongate. The eyes on their mesal margin deeply emarginate, ocelli wanting; Thorax highly arched, more or less projecting over the head, flattened in front of the scutellum, pectus very prominent, scutellum small; metanotum well-developed; the markings of the thorax, if not unicolored, consist of three, usually wide longitudinal stripes, of which the median is posteriorly and the two laterals anteriorly abbreviated; sometimes the median stripe is divided longitudinally by a fine line, which continues to the scutellum. Abdomen cylindrical, in the male sometimes flattened, the last or anal segment distinctly separated from the preceding, longer than broad, the genitalia projecting tong-like, the claspers filiform or leaf-like. Legs long and slender, particularly the fore pair, of which the tibiae are frequently very short, while the fore metatarsus is always longer than its tibia; the fore tarsi of the male are sometimes peculiarly haired; the tarsal claws and pulvilli upon all the feet are small but distinct. The wings are bare, in the male often shorter than the abdomen, the anal angle always present, sometimes strongly projecting; subcostal vein delicate but distinct, as is also R_1 which enters the costa beyond the middle of the wing; R_{4+5} emerges from the small crossvein, at its extremity usually slightly curved downward, entering the margin not far from the apex of the wing; the media is unbranched and joins

the wing margin at or a little below the apex; the cubitus is forked; the R-M crossvein is at about the mid length of the wing; the humeral crossvein is sometimes wanting.

To the above description I may add that R_{2+3} is present though usually quite delicate. The male genitalia consist of a dorsal downward curved keel, a pair of elongate lateral lobes, a pair of inferior and a pair of superior lobes (pl.32, fig. 7 to 13).

KEY TO SPECIES OF CHIRONOMUS

Larvae

The tooth on the middle line of a labium having an odd number of teeth will be called the middle or median tooth, the first tooth laterad of this will be called the first lateral; the second, the second lateral, and so on. When there is an even number of teeth, the first one laterad of the median line will be called the first lateral; the second, the second lateral, etc.

a Labium with an odd number of teeth (i. e. center line bisects the middle tooth)

b Middle tooth broadly truncate, pl.21, fig.18; pl.23, fig.15

c First lateral tooth smaller than the second, second truncate, pl.23, fig.15.....59. ? *plumosus*

cc First lateral about same size as the third,....16. *flavicingula*

bb Middle tooth rounded

c Middle tooth trilobed

d Teeth short, pl.23, fig.8.....60. *decorus* n.sp.

dd Teeth long, pl.23, fig.13.....79. *Chir.* sp.

cc Middle tooth simple

d First and second lateral teeth rather closely united, pl.21, fig.1

c Teeth as shown on pl.21, fig.1.....25. *tenellus*

cc First and second laterals more distinctly separated than shown on this plate.....48. *dux* n.sp.

dd First and second laterals as distinctly separated as the other teeth

c Middle tooth shorter than the first laterals; blood red larva

80. *Chir.* sp.

cc Middle tooth as long or longer than the laterals

f Second and third laterals longer than the first laterals and closely united, pl.37, fig.27.....63a. *tentans*

ff Not as above

g Second laterals longer than the first and third

h As shown on pl.23, fig.1.....60a. *dorsalis*

hh As shown on pl.37, fig.25.....63. *prasinus*

gg Teeth gradually becoming smaller from the median line towards the lateral margin

h Teeth almost uniform in size, pl.22, fig.7..81. *Chir.* sp.

hh Middle tooth distinctly larger

i Middle tooth semicircular, pl.23, fig.3..52. *lobiferus*

ii Middle tooth hyperbolic, pl.22, fig.11..43. *modestus*

aa Labium with an even number of teeth

b The two middle teeth much paler in color than the others, pl.22, fig.22
82. *Chir.* sp.

bb The teeth uniformly dark

c Middle pair (first laterals) shorter than the second laterals, pl.22, fig.2444. *fulviventris* n.sp.

cc Middle pair as long or longer than the laterals

d Middle pair (first laterals) noticeably longer than the second laterals

e Third laterals longer than the second, pl.22, fig.1

41. *flavus* n.sp.

ce Third laterals about same size as the second; bloodworms, pl.21,

fig.632. *nigricans* n.sp.

dd The middle pair about the same size as the second laterals;
bloodworms, pl.23, fig.6. No. 83; and pl.22, fig.21, No. 84

Pupae

aa Lateral fin of the eighth abdominal segment terminates in a spur, which may be simple or toothed

b Spur simple, without teeth

c Abdominal segments each with a few long setae, pl.22, fig.20

40. ?*fulvus* n.sp.

cc Abdominal segments each with a pattern of very minute spines

d Spurs of eighth segment stout, pl.23, fig.12, 60. *decorus* n.sp.

dd Spurs slender and seta-like

e See pl.22, figs. 8 and 12.....43. *modestus*

ce See pl.21, figs. 2 and 3.....25. *tenellus*

bb Spur, if present, with teeth

c Spur wanting, pl.22, fig.14.....43b. Var. of *modestus*

cc Spur present

d Large species over 15 mm. in length, pl.23, fig.14

59. ?*plumosus*

dd Smaller species

e Each abdominal segment with a fuscous transverse band near the anterior margin, produced at the ends into lateral longitudinal vittae, pl.22, figs. 3 and 4.....41. *flavus* n.sp.

ce Not so marked. Species from Saranac Inn, pl.22, figs. 13 and 17, and fig.18 (perhaps *Tanytarsus* sp.)

aa Lateral fin with a comb of three or more teeth

b Comb with three distinct teeth, pl.22, fig.26

44. *fulviventris* n.sp.

bb Comb not as shown in this figure

c The median abdominal segments each marked with three transverse bands: the first and third narrow, the middle one wide with a number of hyaline spots, pl.21, figs. 16 and 17

16. *flavicingula*

cc Abdominal segments not so marked

d In nearly mature pupae may be seen the lobes on the dorsum of each abdominal segment of the enclosed imago, pl.23, figs. 4 and 5.....52. *lobiferus*

dd Not as above

e Dorsum of each median abdominal segment marked with spines of several sizes; those in a transverse row near the anterior and the posterior margins are most prominent

32. *nigricans* n. sp.

cc The spines most conspicuous in two oblong patches beyond the middle of each segment

f The teeth of the comb of the eighth segment projects caudad. pl.22, figs. 15 and 16.43a. Var. *a* of *modestus*

ff Teeth of the comb of the eighth segment project laterad. Markings on the abdomen resembles pl.22, fig.15, but covers more area on the anterior segments.48. *dux* n. sp.

Weyenbergh (1874) gives a few notes on the larvae of several species, among others, *C. nubeculosus*, *diversus*, *riparius*, *annularis*, *chloris*, *virescens*, and *tentans*. Of *tentans* only is a description given. Doctor Dyar (1902) gives descriptions of larva and pupa of *C. anonymus* Will. (No. 55). This description is in part reproduced on a subsequent page.

Imagines

Most of Say's and Wiedemann's species have been recognized and have been placed in the following key. Of Walker's species only one or two have been recognized and for this reason a separate key is given upon a subsequent page for them:

a Wings with spots or cross bands

b Dorsum of thorax polished black (humeri may be yellow)

c Humeral region of thorax tinged with yellow, wing with only a faint cloud1. *brachialis*

cc Thorax entirely black (var. of above?)2. *atrimanus*

bb Dorsum of thorax not polished black

c Wings with spots

d Each wing with about eleven spots; brownish or greyish species; 3 mm. in length (New Mexico)3. *varipennis*

dd Wings not so marked

e Thorax pale yellow, wing with four spots; length 1.2 mm. Cuban species.4. *octopunctatus*

cc Thorax brownish

f Wing with three dark spots; thorax indistinctly striped; abdomen dusky; length 2 to 2.5 mm.5. *scalaenus*

ff Wing with five or six spots, or bars; abdomen of female with whitish posterior margins to the segments; length 2 mm. (St Vincent Island)6. *spilopterus*

cc Wings with cross bars

d Brownish species; abdomen of female black with white posterior margins to the segments; length 2 mm. (St Vincent Island)

6. *spilopterus*

dd Yellowish or greenish species

c Legs pale; tibiae with black tips; thorax and abdomen yellow; length 4 mm.7. *fascipennis*

cc Some or all femora partly black; metanotum with brown vittae or spots; length about 4 mm.

f "Metanotum marked with a transverse pair of triangular brown spots"8. *taeniapennis*

ff "Metanotum marked with a pair of brown spots which approach each other posteriorly." (This may be a synonym of the *taeniapennis* above). 9. *pulchripennis*

aa Wings unmarked, excepting sometimes with darkened crossvein

b Dorsum of thorax and abdomen black. The former may have indistinct stripes and the latter may have paler incisures

c Legs black or fuscous

d Thorax shining black

e Halteres white; wings white, immaculate; male; length 2.75 mm.10. *brunnipes*

cc Halteres with brown knob; wings hyaline, very slightly smoky, with anterior veins and crossvein brown; fore metatarsus nearly twice as long as its tibia; length 3.5 mm.

11. *brunneipennis* n. sp.

dd Thorax grayish, with black stripes; abdomen black

e Abdomen uniformly dark brown or black; halteres white with end of knob brown.12. *caliginosus* n. sp.

cc Abdomen with whitish incisures or margins

f Fore metatarsus $\frac{1}{2}$ longer than its tibia; halteres dark in the male, paler in the female; anterior tarsi of the male with long hairs.13. *niveipennis*

ff Fore metatarsus $\frac{1}{4}$ longer than its tibia

g Anterior tarsi of the male long-haired; abdominal segments with narrow white posterior margins; wings hyaline with black crossvein (Greenland)14. *hyperboreus*

gg Anterior tarsi of the male short-haired; abdominal segments with cinereous margins; wings slightly cinereous

15. *staegeri*

cc Legs more or less pale

d Halteres with gray or black knobs

e Femur black with yellow apical ring; tibia black and yellow; wings with black crossvein.16. *flavicingula*

cc Legs not so marked

f Mesonotum and scutellum shining black

11. *brunneipennis* n. sp.

ff Mesonotum pruinose, scutellum yellowish; length 2.3 mm.

17. *halteralis*

dd Halteres with pale knobs

e Basal joint or joints of abdomen yellow

f First and second abdominal segments yellow; male

18. *nitidellus*

ff First segment only yellow.19. *fallax* n. sp.

cc Basal joints black*f* Crossvein clouded with black or brown

g Fore metatarsus about $1\frac{1}{2}$ times its tibia in length; anterior tarsi of both sexes very slender and without hairs or with but few hairs; legs pale.....20. *riparius*

gg Fore metatarsus less than $1\frac{1}{4}$ times its tibia in length; anterior tarsi of the male bearded

h The second fore tarsal joint shorter than the third; male fore tarsi long and densely bearded....21. *barbipes*

hh The second fore tarsal joint longer than the third; male fore tarsi long but thinly bearded....22. *annularis*

ff Crossvein not clouded

g Length about 7 mm.; black, abdomen black, in the male sometimes with yellow lateral spots; male fore tarsi delicately bearded; fore metatarsus about $1\frac{1}{2}$ times the length of its tibia.....23. *dispar.*

gg Length less than 6 mm.

h Thorax shining black, not striped; abdomen black

i Legs blackish, fore metatarsi white; length 4 mm.

24. *albinus*

ii Legs pale yellow; abdomen of female with paler base; length 3.5 mm.....25. *tenellus*

hh Thorax duller, with indications of black or grey stripes

i Abdomen either olive green, or black and white

j With dark olive green abdomen; legs ferruginous; length 4.5 mm.; male.....26. *chloris*

jj With white posterior margin on each abdominal segment; legs black and white; length 4 to 5 mm.

k Fore femora black, fore metatarsus less than 1.33 times as long as its tibia.....27. *devinctus*

kk Middle section of each femur, white; fore metatarsus about 1.66 times its tibia in length

28. *californicus* n. sp.

ii Abdomen black

j Thorax blackish with black stripes; legs wholly white, except sometimes middle section of fore femora is brownish (abdomen of male is white); female32. *nigricans* n. sp.

jj Thorax dark brown with broad yellowish median vitta on anterior half and a pair of gray vittae on posterior part; abdomen velvet-black, hairs yellow (District of Columbia).....29. *palliatu*s

bb Thorax or abdomen or both with considerable green or yellow or gray
c Thorax entirely shining black, excepting sometimes the humerus, which may be yellow

d Abdomen yellow with brown bands.....1. *brachialis*

dd Abdomen bright green, paler when dry, posterior segments darker
e Halteres wholly pale.....30. *pedellu*s

- ce* Halteres with black tip.....31. *pedestris*
- cc* Thorax not shining black
 - d* Legs dark brown; thorax yellow with three black stripes; female
10. *brunnipes*
 - dd* Legs more or less yellow
 - e* Thorax dark brown with three broad black stripes; abdomen nearly white, excepting sometimes the last three segments; incisures occasionally slightly fuscous
 - f* Legs white, the middle section of each fore femur occasionally brownish; male.....32. *nigricans* n. sp.
 - ff* Legs white, apical one third or one half of each fore femur and basal one third or one half of each tibia black; middle and hind knees sometimes also darkened; last three abdominal segments blackish; male.....30. *pedellus*
 - ce* Thorax not so marked when the abdomen is pale
 - f* Abdomen fuscous, the anterior segments yellowish green
33. *aberrans* n. sp.
 - ff* Abdomen not marked in this manner
 - g* Abdomen nearly uniform in color
 - h* Abdomen brown, olive green or black
 - i* Abdomen dark olive green; legs ferruginous; fore femora dark; crossvein not clouded; female
26. *chloris*
 - ii* Abdomen dark green, brown or black
 - j* Thorax yellow unstriped; abdomen brown; legs yellow; length 3 to 4 mm. (St Vincent Island)
34. *lugubris*
 - jj* Thorax brown or yellowish with stripes
 - k* Legs wholly yellow; abdomen black with yellowish base; female.....25. *tenellus*
 - kk* Legs partly brownish
 - l* Thorax dark brown with broad yellow median vitta, and a pair of gray vittae on posterior part; abdomen velvet black; anterior femora brownish29. *palliatu*s
 - ll* Thorax with black or brown stripes
 - m* Halteres pale; female with dark greenish abdomen; fore metatarsus nearly twice as long as its tibia.....35. *fumidu*s n. sp.
 - mm* Knob of halteres with a dark tip; abdomen fuscous12. *caliginosu*s n. sp.
 - hh* Abdomen pale, bright green or yellow; in dried specimens sometimes somewhat brownish; crossvein uncolored
 - i* Species exceeding 6½ mm. in length
 - j* Abdomen of female yellow; male with darker markings in front of incisures; pectus, metanotum and scutellum pale; dorsum yellow with three dark yellow stripes; length 6.5 to 7.5 mm...36. *tendens*

- jj Thorax pale greenish, with a "fuscous longitudinal line on the anterior dilated line"....37. *lineatus*
 - ii Species less than 6 mm. in length
 - i Thorax reddish yellow, shining, with three dark brown stripes; metanotum brown, scutellum yellow; abdomen green (when dried sometimes brownish); legs yellow; tarsal articulations usually darkened; fore metatarsus but little longer than its tibia; length 5 to 6 mm....38. *albipennis*
 - jj Not as above; thoracic stripes buff-colored
 - k Thorax and abdomen green, the former with a median black line, besides the usual buff-colored stripes; metanotum with a black spot; length 5 mm.39. *taenionotus*
 - kk Thorax without the black median line
 - l Species having the fore metatarsus more than $1\frac{2}{3}$ times as long as its tibia
 - m Yellow species (in dried specimens)
 - n Deep yellow species, usually 3 to 4.5 mm. in length; fore metatarsus about 1.75 times the length of its tibia; female
 - 40. *fulvus* n. sp.
 - nn Pale yellow species with a striped thorax; abdomen having a greenish tinge in living specimen; length 2 to 2.5 mm.
 - 41. *flavus* n. sp.
 - mm Abdomen green and usually thorax also
 - n Fore tibia two thirds as long as its femora, fore metatarsus nearly twice as long as the tibia; length 3.5 to 4.5 mm.
 - 42. *brevitibialis*
 - nn Fore tibia more than two thirds as long as the femora
 - o Species 3.5 mm. or more in length
 - p Male genitalia with the lateral arms slender, and somewhat lanceolate; thorax with buff-colored stripes; its ground color greenish yellow or yellow in the male; green in the female
 - 43. *modestus*
 - pp Genitalia of male with the lateral arms much prolonged and clubbed at the end. pl.32, fig.9
 - 43. Var. b. *modestus*
 - oo Species 3 mm. or less in length
 - 43. Var. a. *modestus*

- ll* The fore metatarsus less than 1.4 times as long as its tibia
- m* Yellow or whitish species
- n* Deep yellow species; female with greenish tinged abdomen; male with brown abdominal fasciae; fore metatarsus about $1\frac{1}{8}$ times as long as its tibia; length 4 to 5 mm.44. *fulviventris* n. sp.
- nn* Species with white or very slightly green-tinted abdomen; thorax testaceous; knees blackish, fore metatarsus about 1.25 times as long as its tibia; length 4 mm. (See also No. 54)45. *pallidus* n. sp.
- mm* Green species
- n* Joints of the legs each with a moderately wide black apical band; fore femora and fore metatarsus of about equal length and each about 1.33 longer than the tibia
46. *frequens* n. sp.
- nn* Joints of legs without distinct black apices
- o* Fore femora and tibiae of equal length; fore metatarsus about 1.33 times as long as the tibia; fore tarsi of male hairy
47. *viridis*
- oo* Fore femora noticeably longer than the tibiae; fore tarsi of male bare
48. *dux* n. sp.
- gg* Abdomen bicolored, each segment with crossbands or marked incisures which may be light or dark, yellowish or brownish
- h* Thorax with wide black stripes
- i* Species over 7 mm. in length; thorax green or greenish yellow in ground color; thoracic stripes shining; legs yellowish, knees, fore tibiae, and tarsi in part, blackish; crossvein clouded....49. *viridicollis*
- ii* Species 5 mm. or less in length
- j* Thorax reddish with black stripes; scutellum black, abdomen yellow and black; legs and antennae yellow; length 5 mm.; male.....50. *jucundus*
- jj* Thorax yellow with a blackish V-shaped mark on the dorsum; abdomen yellow with black band on posterior margin of segments 1 and 2; fourth and part of fifth black; metatarsus 1.25 times as long as the fore tibia (St Vincent Island)
51. *longimanus*
- hh* Thorax with grayish, brownish or ferruginous stripes
- i* With an oval lobe or mace shaped prominence on each abdominal segment; wings with faint cloud on crossvein; length 7.5 mm.....52. *lobiferus*

- ii Abdomen not marked in this manner
 - j Crossvein pale
 - k Abdomen yellowish green; black or brown markings in front of the incisures
 - l Thorax pale greenish, the dilated lines yellowish testaceous with a "longitudinal narrow line very distinct and fuscous on the anterior dilated line;" length 7.5 mm. (=lineola Wied.) (Illinois).....37. *lineatus*
 - ll Without fuscous line on the anterior dilated line
 - m Ground color of thorax pale greenish (when recent); abdomen pale greenish, the segments distinctly tipped with blackish above; length 6.5 to 9 mm. (This may be a synonym of *tendens*).....53. *festivus*
 - mm Ground color of thorax yellowish
 - n Length 6.5 to 7.5 mm. Abdominal segments slightly darker on apical margin
 - 36. *tendens*
 - m Length 5 mm. or less
 - o Thoracic stripes brownish; fore metatarsus about one fourth longer than its tibia51. *longimanus*
 - oo Dark yellow species; abdomen yellow with ferruginous transverse bands on the segments; fore metatarsus one eighth longer than tibia; male
 - 44. *fulviventris* n. sp.
 - kk Abdomen not marked thus; species 5 mm. or less in length
 - l Thorax yellow, not striped; abdomen yellow; fore metatarsus one fourth longer than its tibia; length 2 to 2.5 mm.; male (St Vincent Island)54. *willistoni* nom. nov.
 - ll Thorax striped
 - m Abdomen yellow with ferruginous transverse bands on the segments; fore metatarsus about one eighth longer than its tibia; legs yellowish; male
 - 44. *fulviventris* n. sp.
 - mm Abdomen more or less brown or dusky
 - n Abdomen black with the first segment and the distal part of the next 2 or 3 yellowish; fore metatarsus twice as long as its tibia; length 4 to 5 mm.; male (St Vincent Island)55. *anonymus*
 - nn Abdomen not marked in this manner
 - o Abdomen black with segments 7 and 8 yellow; the fore metatarsus about one third longer than its tibia (St Vincent Island)
 - 56. *innocuus*

- oo Abdomen brown, posterior margins of anterior segments widely yellowish, with cinereous bloom; crossvein indistinctly clouded; fore metatarsus over two thirds longer than its tibia; length 3 to 4 mm. (Illinois and New York)
- 57. *similis* n. sp.
- jj Crossvein clouded with brown
 - k Brownish species with strongly defined wing veins; length 6 mm.....58. *redeuns*
 - kk Not such species
 - l Fore tibiae blackish; in mature specimens the dorsal stripes and metanotum black; fore metatarsus 1.5 times longer than its tibia; length 7 to 9 mm.....49. *viridicollis*
 - ll Fore tibiae pale
 - m Large species 10 or 12 mm. in length; fore metatarsus 1.25 times the length of its tibia; male fore tarsi long haired
 - n With dusky thoracic stripes
 - 59. *plumosus*
 - nn With reddish thoracic stripes
 - 59a. *ferrugineovittatus*
 - mm Smaller species
 - n Dorsum of thorax whitish or pale cinereous or greenish, with reddish stripes
 - o Fore metatarsus over 1.33 times its tibia in length; male fore tarsi bare
 - p Metanotum reddish or brownish, fore metatarsus 1.6 times its tibia; length 5 to 7 mm.....60. *decorus*
 - pp Metanotum blackish; fore metatarsus less than 1.5 times its tibia in length
 - 60a. *dorsalis*
 - oo Fore metatarsus about 1.2 times its tibia in length; male fore tarsi hairy; abdominal fasciae reddish, incisures whitish; length 7.5 mm. 61. *stigmaterus*
 - nn Dorsum of thorax with brown or cinereous stripes
 - o Length 3 or 4 mm.; fore metatarsus about two thirds longer than its tibia
 - 57. *similis*
 - oo Larger species
 - p Fore tarsi of male bare
 - q Male claspers slender; fore metatarsus about 1.5 times its tibia in length; dorsum of thorax yellow with brownish gray stripes; head blackish; length 8 mm.
 - 62. *cristatus*

qq Male claspers stout; abdomen gray, segments with pale margins

62a. *tentans*

pp Male fore tarsi with long hairs; fore metatarsus about one fourth longer than its tibia; abdomen with a tinge of green. (= *intermedius*)

63. *prasinus*

Auxiliary key to species of Chironomus (sens. lat.)

This key contains those species of the group *Chironomus*, the descriptions of which are too brief or imperfect to permit of a place in the foregoing or in the keys which are to follow. With but three exceptions the species contained in it were described by Francis Walker:

a Abdomen dark. Species with brown, gray or black thorax, usually not striped

b Hairy black species, 7.5 mm. long; wings white with fuscous costa; halteres a dirty ochre; Arctic species.....64. *polaris* Kirby

bb Not as above

c With dark halteres

d Species 5 mm. or more in length; legs dull yellow; hairy; fore feet very long.....65. *attenuatus*

dd Less than 2 mm. in length

c Length 2 mm.; chest thick; wings white; bare; male

66. *crassicolis*

cc Length 1 mm.; wings hyaline; hairy?.....67. *fimbriatus*

cc With pale halteres

d Tibiae and tarsi with black articulations; black species; 4.5 mm. long; abdomen yellow at base; wing with cross band; bare

68. *nigritibia*

dd Not as above

c Gray species; abdomen black with white rings; length 6 mm.; Arctic species.....69. *borealis* Curt.

cc Brown species

f Species 6 mm. long. Thorax reddish striped, pleura whitish; abdomen dark brown, incisures paler; wings whitish, bare; male70. *albistria*

ff Species less than 4 mm. in length

g Length 3.5 mm. Thorax brown, gray-striped; halteres yellow; wings hairy? male.....71. *brunneus*

gg Length 1 mm. Thorax brown; halteres pale brown; wings hairy?67. *fimbriatus*

aa Abdomen usually pale; species with green, pale red or yellow thorax; striped, excepting in a few of the palest

b Abdomen dark brown, or if not, then with black markings or margins on the anterior segments

c Posterior margin of segments black; thorax with broad black stripes; scutellum black; length 5 mm.; male....50. *jucundus*

cc Abdomen brown with paler margins

d With metathorax black, femora yellow, tarsi dark, wings with the usual spot; hairy? Length 5 mm.; male.....72. *lasiopus*

dd Not as above

e Thorax reddish, striped, with two white side stripes; pleura hoary; scutellum pale red; legs pale tawny; tips of thighs, shanks, and feet darker; wings bare. Length 6 mm.

70. *albistria*

cc Thorax testaceous with three brown stripes; pleura pale with dusky spots; abdomen with spots on sides of last two segments; middle and hind tibiae dusky; wings unspotted (see *Orthocladus*)oceanicus Packard

bb Abdomen, basal half at least, yellow or green, no black markings on anterior segments

c Wings with a brown cross band; body straw-colored; length 3 mm.; male (habitat unknown).....73. *hilaris*

cc Wings without band

d With brownish or reddish abdomen and thorax

e Fuscous species 3.5 mm. long; male; wings hairy?

71. *brunneus*

cc Abdomen brown with broad, dingy, yellow bands on posterior part of the segments; metathorax black; wings with stigma; hairy? Length 5 mm.....72. *lasiopus*

dd With yellow or greenish thorax and abdomen

e Species 5 mm. or more in length

f Large species 9 mm. in length, with green thorax; abdomen yellow; wings white; hairy? (See the genus *Eurycnemus*)lasiomerus

ff Species 5 to 6 mm. in length

g Saffron or pale orange-colored species; legs pale yellow; wings hyaline, fringed, hairy? Female. (See the genus *Eurycnemus*)unicolor

gg Thorax silky white with three tawny stripes; abdomen yellow, last two segments dull; legs yellow, a tawny band around each thigh; wings hairy?....74. *auticus*

cc Species 2.5 mm. or less in length

f General color citron yellow; the thoracic stripes each with a black dot at tip; wing bare? Length 2.25 mm.

75. *bimacula*

ff Without black dot at tip of each thoracic stripe

g Thorax pale yellowish green, with three dull red stripes; metathorax brown; length 2 mm.; male and female; wings hairy?.....76. *confinis*

gg General color yellowish green

h Length 1.5 mm.; antennae pale brown; wings deeply fringed; hairy?.....77. *pellucidus*

hh Length 2 mm.; antennae yellow; male; wings hairy?

78. *trichomerus*

1. *Chironomus brachialis* Coquillett.

1901 *Chironomus* Coquillett. Proc. U. S. Nat. Museum. 23:607
1902 *Chironomus ? atrimanus* Coq. Proc. Nat. Mus. 25:94

Male. Head black, the face brownish yellow, mouth parts brown, first joint of antennae black, the others yellow, hairs of antennae pale yellow, changing into white at their apices; thorax and scutellum black, polished; abdomen yellow, middle of dorsum of second segment prolonged to the lateral margin at the hind end, on the front end extending entirely around the segment, narrow bases of the three succeeding segments and whole of the following ones, including the genitalia, brown; legs yellow, apex of front femora, front tibiae and their tarsi except the basal two thirds of first joint, knees of other legs, apices of their tibiae, sutures of first three tarsal joints and whole of the two following brown, front tarsi fringed with rather long hairs on outer side of second and third joints; wings bare, basal portion hyaline and with yellow veins, the remainder grayish hyaline and with brownish veins, an indistinct darker brown spot on the small crossvein; halteres yellow. Length 5 mm.

Female. As in the male except that the first antennal joint is yellow, broad humeral region tinged with yellow, second and three following abdominal segments largely brownish (front tarsi wanting), wings with a broad brown cross band which in its outer portion includes the small crossvein. Habitat Westville, N. J.

A male specimen from Ithaca, N. Y., agrees with the above description excepting that the antennal hairs are wholly yellow. In this specimen the thorax when viewed obliquely is faintly pollinose; the last three abdominal segments are flattened; the genitalia rather short; the fore metatarsus is about one fourth longer than its tibia; and the venation as shown on pl.28, fig.1.

2. *Chironomus atrimanus* Coquillett

1902 *Chironomus* Coquillett. Proc. U. S. Nat. Mus. 25:94

This may possibly be identical with the preceding.

Female. Head yellowish brown, antennae yellow, the last joint and the mouth parts brown; thorax and scutellum black, highly polished; abdomen somewhat polished, black, the first segment yellow, hind margins of three to six yellowish; legs yellow, front tibiae and their tarsi black, apices of femora, both ends of middle and hind tibiae, apices of joints of their tarsi and whole of the last two joints blackish, front tibiae four fifths as long as the first joint of their tarsi; wings strongly tinged with yellow on the basal third, followed by a wide brown band extending from costa to fifth

vein (cubitus) remainder of wing hyaline; halteres yellow; length 4.5 mm. Kansas City, Missouri.

3. *Chironomus varipennis* Coquillett

1902 *Chironomus* Coquillett. Proc. U. S. Nat. Mus. 25:94

Male. Head and body dark brown, a large dull yellowish humeral spot, antennae except the first joint yellow, the hairs gray; thorax opaque, largely gray pruinose, narrow hind margins of abdominal segments gray pruinose; femora brown, the ends narrowly and a band before the apex of each, yellow; front tibiae very short, yellow, the bases brown, other tibiae brown, an indistinct yellowish ring beyond the base; front tarsi wanting, the others yellow; wings whitish, marked with 11 brown spots as follows: Three in a row behind the fifth vein (cubitus), one before middle and another in middle of apical margin of third posterior cell (cell Cu_1) one in base of first posterior (cell R_{4+5}), another in the cell below it, and a third midway between the latter and the base of this cell, one in middle and another in apex of first posterior cell (cell R_{1+2}), also a small one in apex of second posterior cell (cell M); halteres whitish; length, 3 mm. Las Vegas, Hot Springs, N. M.

4. *Chironomus octopunctatus* Loew

1861 *Chironomus* Loew. Wiener Ent. Monatschr. 5:33

1878 *Chironomus* O. S. Catl. N. A. Dipt. p.21

Male and female. Pallidly yellow, the tips of femora and tibiae black, wings with four blackish spots. Length 1.2 mm., wing 1.3 mm.

Very pale yellow, legs whitish; posterior part of the thorax shining white and on each side with a darker line. The abdomen fuscous with posterior margin of each segment pale yellow. The tips of the femora rather widely, and of the tibiae rather narrowly, black. Anterior tarsi six times longer than the tibiae. Wings whitish, veins pale yellow; each wing with four blackish spots, in certain lights iridescent; the first is at the anterior fork, the second is between that and the tip of the wing; the other two are at the posterior margin; one of them, composed of two contiguous spots, is situated where the second branch of the cubitus enters the wing margin, the second one midway between this and the base of the wing. Cuba. Translation. Loew, loc. cit.

5. *Chironomus scalaenus* Schrank

1803 *Tipula* Schrank. Fauna Boica. 3:73, 2324

1818 *Chironomus* Meigen. Syst. Besch. 1:54

1850 *Chironomus* Zetterstedt. Dipt. Scand. 9:3501

1864 *Chironomus* Schiner. Fauna Austr. 2:600

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. 1:266

Head dark brown; the palpi lighter, the antennae yellowish, the antennal hairs of the male pale brown. Thorax and abdomen blackish brown, the thorax sometimes a little lighter with indistinct stripes; the next to the last abdominal segment of the male is broad, the last much smaller; the claspers yellowish, filiform, quite long; the hairs of the abdomen pale yellow. Legs pale yellow; the extreme tip of each tibia with a brown spot; the fore metatarsus is fully twice as long as its tibia; the fore tarsi of the male slightly hairy, yet not bearded. Halteres pale yellow. Wings with a whitish tint and three gray spots which are particularly distinct in the female; one in the anal cell, another in the fork of the cubitus and the last distad of the crossvein. Length 2 to 2.9 mm. Translation. V. d. Wulp. loc. cit.

This fly has been recorded from New Hampshire. About a dozen specimens, male and female, from Ithaca, N. Y. and Washington State agree with the above description excepting in the following particulars: The space separating the two larger spots upon the wing is filled by a very faint cloudiness; the thorax and abdomen are rather brownish in color, the segments of the latter with indistinct paler posterior margins, in some specimens the bases of the femora and the tarsi are slightly infuscated and the fore metatarsus is $1\frac{3}{4}$ instead of twice as long as its tibia. The length also ranged from 1.5 to 2 mm. instead of from 2 to 3 mm. (pl.28, fig.2). As I had no European specimens for comparison I hesitated to pronounce my specimens as distinct species.

6. *Chironomus spilopterus* Williston

1896 *Chironomus* Williston. Trans. Ent. Soc. Lond. 273

(Pl.28, fig.3)

Male and female. Face and front yellowish brown. Basal joint of antennae brownish-yellow; flagellum brownish, the plumosity of the male antennae blackish gray. Mesonotum brown or yellowish brown, lightly white dusted; in well preserved specimens brown vittate on the sides, and in front in the middle. Pleura black, in part luteous. Scutellum yellow or yellowish brown. Abdomen black, with yellowish hair; in the male, slender; in the female, broader, and with whitish posterior margins to the segments. Legs yellow, with rather abundant yellow hair; femora in part brown or brownish; front tibiae not more than one half of the length of the front metatarsi. Wings whitish hyaline, with pale blackish spots, which are more distinct when seen obliquely, and situated as follows: One near the base, another near the middle, and a third near or at the tip of the first posterior cell

(cell R_{4+5}); a streak near the middle, and a spot near the tip of the cell in front of the forked cell; a spot on the posterior branch of the furcation, and one or two in the anal angle. Length 1.75 to 2.25 mm. St Vincent Island.

7. *Chironomus fascipennis* Zetterstedt

1838 *Chironomus* Zett. Ins. Lappon. 813, 21

1850 *Chironomus* Zett. Dipt. Scand. 9:3505

1864 *Chironomus* Schiner. Fauna Austr. 2:599

Male. Wholly pale yellow, not shining; the antennae testaceous, somewhat infuscated, the first joint yellow, the hairs sordidly yellow. The eyes black. The palpi fuscous. The thorax with three yellow stripes; the wings hyaline, with two moderately wide fuscous cross bands, one at the middle of the wing, rather faint, the other a little more distinct at the tip; besides this there is a fuscous spot at the base. Halteres white. The legs pale, somewhat pilose, middle and hind tibiae with black tips. Anterior tarsi bare. Length 3.5 mm. New Jersey (Johnson).

8. *Chironomus taeniapennis* Coquillett

1901 *Chironomus* Coquillett. Proc. U. S. Nat. Mus. 23:607

1902 *Chironomus* ? *pulchripennis* Coquillett. Proc. U. S. Nat. Mus. 25:94

Female. Yellow, tinged in places with green, especially on the abdomen, mouth parts, apical half of the femora, bases of front and middle tibiae and nearly the whole of the hind ones brown. metanotum marked with a transverse pair of triangular brown spots; wings whitish, the costal cell from the humeral crossvein to apex of auxiliary vein (Sc), a cross band extending from the latter point to hind margin of wing where it is greatly dilated, finally the apical fourth of wing, black. Length 4 mm. Massachusetts, New Jersey. Coquillett, loc. cit. Illinois, New York, South Dakota, Pennsylvania.

Upon a comparison of the above description with that of *pulchripennis* it will be seen that they greatly resemble each other. The examination of a series of Ithaca specimens shows considerable variation in the extent of the dark coloring. To the description I may add that the male does not differ from the female except that the flagella of the antennae are brownish; the genitalia yellow, the lateral arms long, the keel slender, curved, and not much enlarged. In the living specimen the general color is quite green, but upon drying some specimens become almost yellow. The abdominal markings are variable; in some

the last four segments have upon them irregular blotches of brown or black. The posterior end of the lateral thoracic stripes range from a pale yellow in some specimens to a dark brown in others; depending, perhaps, upon their maturity. The amount of black upon the legs is also variable; in an extreme case all the tibiae and the femora except the immediate bases of the latter are black. The fore metatarsus is about one fourth longer than its tibia. Described from numerous specimens (pl.28, fig.4). I have a purchased specimen, collector unknown, bearing the label, *C. fascipennis* Zett., Riverton, N. J., which is not the latter species but is *C. taeniapennis*.

9. *Chironomus pulchripennis* Coquillett

1902 *Chironomus* Coq. Proc. U. S. Nat. Mus. 25:94

This seems to be a synonym of *C. taeniapennis* Coq.

Female. Head and antennae yellow, apical half of last joint of the latter and the mouth parts brown; thorax opaque, greenish yellow, mesonotum marked with a pair of lateral brown vittae behind its middle, metanotum with a pair of brown spots which approach each other posteriorly; scutellum and abdomen green, the latter with the hind margins of the segments yellowish, bases of segments six to eight and nearly the whole of the following two brown; legs whitish, the knees black, this color extending nearly to the middle of the middle and hind femora, front tibiae $\frac{1}{5}$ as long as the first joint of their tarsi; wings whitish, the costal cell except its apex brown, a broad brown band crosses the wing, passing over the bases of the first and third posterior cells (cells R_{4+5} and Cu_1) and prolonged along the hind margin nearly to the anal angle, apex of wings broadly brown from the third vein (R_{4+5}) to the upper branch of the fifth (cubitus); halteres white; length 4 mm. Franconia, N. H. Coquillett, loc. cit.

10. *Chironomus brunnipes* Zetterstedt

1850 *Chironomus* Zett. Dipt. Scand. 9:3518, 35

1898 *Chironomus* Lundbeck. Vidensk. Meddel. 273

Black, subshining, thorax of the male the same color, thorax of the female yellow with three black stripes; the antennae and the legs brown; the wings white; the anterior tarsi of the male bare; the metatarsus is a little longer than the tibia; caudal appendages small, short subfiliform. Length 2.7 mm.

Male. Brownish black. Antennae with brown plumosity. Abdomen very narrow, linear, hairy. Caudal appendages short subfiliform, dusky. Wings white, crossvein not clouded; halteres white. Legs brown, tarsi paler, the fore metatarsus is about 1.5

times as long as the tibia, but is twice as long as the second tarsal joint; the remaining joints gradually decreasing in length; legs slender and bare.

Female. Dorsum of thorax yellow with three black stripes. Abdomen rather stout, pubescent. In other respects like the male. Translation. ? Greenland. (Lundbeck.)

11. *Chironomus brunneipennis* n. sp.

Resembles *albinus* Meigen but differs in being slightly larger, in having the knob of the halteres fuscous, and in having the fore metatarsus nearly twice as long as its tibia.

Female. Shining black; legs partly brown. Length 3.5 mm. Head black, proboscis, palpi and antennae fuscous. Thorax including scutellum, metanotum, pleura and pectus shining black; humeri fuscous. Abdomen black, subopaque. Legs brownish; coxae yellowish, femora brown, fore pair yellowish on basal half; tibiae yellowish brown; tarsi brown excepting basal half or two thirds of the metatarsi which are yellowish or brownish yellow. Wings hyaline, very slightly smoky; anterior veins and the cross-vein brown, posterior veins yellow. Halteres fuscous, stem yellowish. Ithaca, N. Y.

12. *Chironomus caliginosus* n. sp.

(Pl.22, fig.5)

Female. Fuscous; legs partly brown; wings smoky. Length 6 mm.

Head, including palpi and proboscis fuscous. Antennae ferruginous, the basal joint and the incisures yellow, apical joint darker. Dorsum of thorax yellow, gray pollinose with three dull black stripes; pleura, sternum, metanotum, and scutellum fuscous. Abdomen fuscous with yellow hairs; posterior margin of segments very slightly grayish; when viewed obliquely from behind the apical half of each segment appears gray pollinose. Fore coxae pale brown, the others fuscous; femora brown; fore femora with basal two thirds and middle femora with basal one half yellow; all tibiae brown; tarsi yellow, tips of the joints brown; fore metatarsus 1.5 times as long as its tibia. Wings smoky, especially along the course of the veins; veins reddish brown including crossvein. Halteres white, with end of knob brown. Two specimens. Ithaca, N. Y.

13. *Chironomus niveipennis* Fabricius

1805 *Chironomus* Fabr. Syst. Antl. 42, 21

1818 *Chironomus* Meigen. Syst. Beschreib. 1:51, 73

1850 *Chironomus* Zett. Dipt. Scand. 9:3566, 92

- 1864 *Chironomus* Schiner. Fauna Austr. 2:598
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. 269, 40
 1895 *Chironomus* Johnson. Proc. Acad. Nat. Sc. Phil. 320
 1838 *Chironomus obscurus* Zett. Ins. Lappon. 815, 31
 1830 *Chironomus pilicornis* Meigen. (nec. Fabr.). Syst. Besch.
 6:254
 1838 *Chironomus rudis* Zett. Ins. Lappon. 809, 3

Larva and pupa. Miall and Hammond (1900) state that the larva inhabits a tube and that it possesses red blood. There are no ventral blood gills. The pupa has a tail fin composed of thirty or forty long setae, and the abdominal segments are laterally expanded. On the second abdominal segment are paired postero-lateral transparent appendages of small size, enclosing blood spaces. There are two conical prominences, each bearing a long seta, on the vertex of the head. The tracheal gill divides into three primary branches as usual. The secondary branches are comparatively few; each encloses a number of tracheae which pass to the ultimate branches.

Imago, male. Black; dorsum of the thorax dark gray, with three black longitudinal stripes, scutellum sometimes brown; abdomen black, at the incisures a little more gray, the last few segments somewhat wider and flattened (as with the males generally), hairs dark, the forceps short and black, the arms slender. Head, antennae and palpi black. Legs black, the tibiae and the tarsi often brownish, the fore tarsi of the male densely bearded with brown hairs; the metatarsus a little longer than the tibia. Wings whitish, the anterior veins more distinct, the crossvein black. Halteres dark. The female does not have the bearded fore tarsi and her halteres are often sordidly white. Length 6 to 7 mm. Schiner, loc. cit.

Florida (Johnson). Some specimens from South Dakota which I identify as this species have both anterior and posterior margin of each abdominal segment grayish, the posterior most distinct; the fore tarsi of the male long but rather sparsely haired, and the fore metatarsus about one-eighth longer than its tibia; the second, third, fourth and fifth fore tarsal joints gradually decreasing in length.

14. *Chironomus hyperboreus* Staeger

- 1845 *Chironomus* Staeger. Kröjer: Naturh. Tidsskr. n. s. 1:349
 1878 *Chironomus* Osten Sacken. Cat'l. N. A. Dipt. 20
 1898 *Chironomus* Lundbeck. Videnskab. Meddel. 272, 49
 1865 *Chironomus polaris* Bohem. Ofv. K. Vet. Akad. Förh.
 574, 18

Blackish, thorax grayish, with three black stripes, abdomen black, with narrow whitish fasciae, wings white with a black spot. Length 7 to 8 mm.

Male. Legs black, the anterior tarsi densely bearded.

Female. Legs fuscous-brown, fore femora testaceous at the base.

"The plumes of the male antennae are black, the abdomen is black, that of the female nearly coal-black, with narrow, sharply marked whitish posterior margins of the segments. The legs are black, those of the female more brownish, the fore femora with a somewhat yellowish base. . . . The fourth tarsal joint of the fore legs is about three quarters the length of the third. The male fore tarsi are densely bearded." Greenland. Staeger, loc. cit.

The male specimens with bare fore tarsi described by Staeger (loc. cit.) as varieties from Greenland, have been separated by Lundbeck (1898) as a distinct species under the name of *C. staegeri* (q. v.)

15. *Chironomus staegeri* Lundbeck

1898 *Chironomus* Lundbeck. Vidensk. Meddel. 271, 48

1838 *Chironomus annularis* Zett. Ins. Lappon. 809, 2

1845 *Chironomus hyperboreus* Staeger. Kröjer: Natur. Tidsskr. n. s. 1:349

1869 *Chironomus* Holmgr. K. Svensk. Vet. Ak. Handl. 8:46

This name was given by Lundbeck to those specimens which Staeger (loc. cit.) considered a variety of *C. hyperboreus* differing from the type in having the anterior tarsi of the male bare.

Male. Antennae nearly as long as the thorax, fuscous black, densely plumose, palpi black. Thorax black, scarcely shining, cinereous puinose; the mesothorax with short hairs, the usual three stripes more or less distinct; the scutellum elevated, bristly. The abdomen fuscous black, pale haired, the apical margin of each segment hoary or cinereous, the caudal appendages narrow and bristly. The wings narrow, cinereous, whitish or lightly smoky tinted, toward the costal margin a little darker; anterior veins strong and dark, the others pale and translucent; the radial veins straight, toward the tip nearly parallel with the media; the subcostal vein slightly curved, the peduncle of the cubitus extends but very little distad of the tip of the basal cell, the branches slightly curved. Halteres dirty white, the tip of the knob and the base of the peduncle often darker. Legs fuscous black, the middle and hind pairs rather long-haired, the fore tibiae and tarsi thinly and shortly haired, fore metatarsus one fourth longer than its tibia.

Female. Similar to the male but the dorsal thoracic stripes are more distinct, apical margins of abdominal segments more widely cinereous or sometimes pale gray; the radial veins lightly curved at the tip; the legs sometimes dilutely black fuscous, sometimes paler. Length 6.5 to 7.5 mm. Greenland. Holmgren (loc. cit.).

16. *Chironomus flavicingula* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:20

1878 *Chironomus* Ost. Sack. Catal. Dipt. N. A. p.20

(Pl.28, fig.6, and pl.32, fig.7)

The blood-red larvae of about 12 mm. length were dredged from the sand in the bottom of a shallow pond near Ithaca N. Y.

Larva. (Pl.21, figs. 13 to 19.) Head dark brown; antennae short; labrum with about ten pairs of pale setae, two or three pairs of which are quite short (fig.15, under surface fig.14); at extreme apex with a pair of fan-like appendages (f), which hang downwards, though shown in the figure folded out in a horizontal plane; caudad of this there is a comb with long, fine, caudad projecting teeth. The epipharynx (fig.13) with three cephalad projecting fan-like organs (f¹) forming the "posterior comb," five or six lateral setae (s), several pairs of ventrad projecting curved and branched setae (s); caudad of these is an arched chitinized piece (fig.13b); laterad of this are the dark brown, chitinized, caudad and ventrad curved lateral arms not shown in the figure. The black tipped mandibles are as usual, with the mesad projecting branched hairs, and two laterad projecting setae; each maxilla (fig.19mx) has prominent palpus, a large seta and numerous papillae on the mesal margin, a pair of large setae at the base of the palpus, another pair (not shown in figure) at base of the mandible. The hypopharynx (fig.19hy) has a rounded apical margin with numerous short hairs and papillae. The labium (fig.18 and fig.19l) has a broad, blunt, central tooth and six small laterals on each side. There are two long setae upon each side of the head below the eyes. The fore feet are short, with very numerous, short, curved, yellow setae. The body seems to be entirely devoid of hairs. Each posterior foot is provided with a number of bilobed brown claws. The dorso-caudal papillae of the last segment are about as long as wide, with 6 or 7 long setae at the tip, and one or two short ones on the side; caudad of these and immediately above the upper pair of blood gills are two more long setae. The blood gills of the eleventh segment are present; those of the twelfth are nearly as long as the posterior feet; slightly conical and four in number.

Pupae. The pupa is dusky in color when nearly mature, showing the colors of the imago. The respiratory filaments are white,

conspicuous in the living specimen and much branched, the setae markings upon the dorsum of each abdominal segment as is shown in fig.16; the seventh and eighth segments are entirely without, and the sixth usually has but few, setae. The posterior margin of the second has the usual black longitudinally ridged fascia. The lateral fin of the eighth segment, together with the terminal spur, are shown in fig.17. The caudal paddle is fringed with long, pale, delicate, matted hairs.

Imago, male. Body gray, with two large white spots on each side of the chest; abdomen fringed with hairs on each side, and having a white silvery band on the hind border of each segment; feelers black; legs black, hairy, a yellow ring near the tip of each thigh, and two yellow rings round each shank; feet dull yellow towards the base; wings colorless, with the usual dark spot on each; veins pale brown; poisers gray. Length of body 5.5 mm., of the wings, 10 mm. St Martin's falls, Albany river, Hudson bay. Walker, loc. cit.

At the head of the division to which this species belongs, Walker states that the wings are hairy. This, however, is evidently an error. To the above description the following may be added.

Male. Head and occiput black, proboscis and palpi dull black, the former with dark brown hairs. Antennae brownish yellow, the large basal joint black, the hairs dark brown. Thorax wholly black, the dorsum and the scutellum with cinereous bloom, the former with three cinereous stripes, the middle one divided by a fine black line, the hairs pale brown. Abdomen velvet black, the posterior margin of each segment dorsally with a moderately wide white fascia extending to lateral margins. When viewed from behind, the last three or four segments appear to me mottled with cinereous, leaving a black median line on the fifth and sixth segments. Venter dull black; genitalia brownish yellow, moderately long (pl.32, fig.7). Abdomen sparsely covered with long, nearly erect, yellowish hairs. Coxae brownish black, moderately shining; femora brown, excepting the yellow basal articulation and a yellow subapical ring; tibiae cream white, with brown base and tip; the brown of the front pair quite pale, the hind pair having in addition a median ring which is sometimes indistinct. In some specimens the basal half of fore tibiae is also brown. Tarsi cream white, the tips of all joints and the whole of the fifth brown, the brown of the fore pair being quite pale. The anterior tarsi are delicately bearded. The anterior metatarsus about one fifth longer than its tibia. Wings hyaline, cross-vein dark brown; venation as figured. Halteres brownish yellow with apical half of the knob dark brown.

Female. Like the male, excepting in the following particulars: Tips of antennal joints reddish brown, the hairs pale; thorax with a little more cinereous coloring, the hairs upon the abdomen a little shorter; fore tarsi bare. Described from a number of specimens. Ithaca, N. Y., Kansas.

17. *Chironomus halteralis* Coquillett

1901 *Chironomus* Coq. Ent. News. p.17

(Pl.28, fig.7)

Head black, palpi and antennae yellowish brown, plumosity of male antennae dark gray; thorax dark brown, the anterior end tinged with yellow, a pair of broad, gray pruinose vittae on the posterior half of the mesonotum, the hairs light yellow; scutellum dark yellow; abdomen black, slightly polished, thinly covered with rather long yellow hairs; femora, tibiae and tarsi yellow, bases of femora slightly tinged with brown; front tarsi slender, almost as long as the body, destitute of hairs, the first joint about twice as long as the front tibia; middle and hind tibiae and their tarsi in the male, thickly covered with rather long yellow hairs, much sparser in the female; halteres pale yellow, the knobs black; wings bare, hyaline, the apical half slightly darker, veins in the basal half yellow, in the apical half more brownish; length 2 to 3 mm. Washington, D. C. Coquillett loc. cit.

A number of specimens from Ithaca, N. Y., agree with this description.

18. *Chironomus nitidellus* Coquillett

1901 *Chironomus* Coq. Proc. U. S. Nat. Mus. 23:608

Male. Head black, mouth parts yellow, antennae, except the basal joint, yellow, the hairs whitish; body black, polished, the first two abdominal segments and the claspers yellow; legs yellow, the femora except their bases, front tibiae wholly, and apices of hind ones brown, front tarsi bare; wings bare, whitish hyaline, the veins brown, halteres yellow; length, 2.5 mm. Riverton, N. J. Coquillett loc. cit.

19. *Chironomus fallax* n.sp.

(Pl.28, fig.8)

Female. Black; first abdominal segment yellow or greenish; legs partly black. Length, 3.5 mm.

Head, including proboscis, palpi and antennae yellowish, the basal joint of the latter somewhat brownish. Thorax cinereous black, with three broad shining black stripes, more distinct when viewed obliquely. Pectus, pleura, and scutellum brown, the

last sometimes paler. Abdomen fuscous, the first segment yellowish-green, in living specimens bright green; the remaining segments more or less distinctly marked with sordidly yellow hind margins; hairs pale brown or yellowish. Fore coxae brown, middle and hind pairs yellow. Legs cream white, the fore femora excepting their bases and tips dark brown; tips of middle and hind tibiae each with minute black comb; pulvilli present, empodium pectinate. Fore metatarsus about 1.4 times as long as its tibia. Wings hyaline with a milky tinge; veins slightly yellowish; venation as shown in figure; halteres yellowish. Ithaca, N. Y.

20. *Chironomus riparius* Meigen

- 1804 *Chironomus* Meigen. Klass. 1:16, 3
 1818 *Chironomus* Meigen. Syst. Besch. 1:23, 6
 1850 *Chironomus* Zett. Dipt. Scand. 9:3489, 7
 1864 *Chironomus* Schiner. Fauna Austr. 2:603
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.253, 8
 1895 *Chironomus* Johnson. Proc. Acad. Nat. Sc. Phil. 320
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.272, 50
 1826 *Chironomus annularis* Macq. Recueil Soc. Sc. Agri. Lille.
 p.194, 2
 1826 *Chironomus viridipes* Macq. Recueil Soc. Agri. Lille.
 195, 4
 1838 *Chironomus zonulus* Zett. Ins. Lappon. p.810, 7

(Pl.28, fig.9)

Male and female. Dorsum of the thorax, especially in front of the scutellum, light gray, with three black longitudinal stripes, the median one divided by a fine line, abbreviated posteriorly though continued to the scutellum by a black line; the lateral stripes abbreviated anteriorly; scutellum gray or grayish yellow; the metanotum gray. Abdomen black, the posterior margins of the segments sometimes with wide, sometimes more narrow whitish bands; the posterior segments gray; forceps small. The antennae brown, the hairs of the same color; the palpi darkened. Legs brownish, yellow or pale yellow, the femora sometimes with a greenish tinge, the articulations dusky; the fore tarsi of the male not hairy; the metatarsus 1.5 times longer than the tibia; the second tarsal joint one half as long as the metatarsus but longer than the third; third and fourth about equal in length. Wings whitish, with a small brown spot. Halteres yellowish. The antennae of the female are yellow at the base. Some specimens have the humeri yellowish or greenish, but these may be distinguished from nearly related forms by their slender fore tarsi. Length 6.75 to 9 mm. Translation in part from Schiner, loc. cit.

According to V. d. Wulp, loc. cit., and Weyenbergh (1874) the larvae are transparent and pale green; some larvae from which I bred this species resemble *C. decorus* n. sp. in the form of the labium as well as in other details. Ithaca, N. Y.; Idaho; Washington State; Pennsylvania; South Dakota; Minnesota; New Jersey; Douglas, Alaska.

21. *Chironomus barbipes* Staeger

1839 *Chironomus* Staeger. Kröjer: Naturh. Tidsskr. 2:561, 5

1850 *Chironomus* Zett. Dipt. Scand. 9:3486, 5

1864 *Chironomus* Schiner. Fauna Austr. 2:601

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.252, 6

(Pl.28, fig.10)

Male. Hairy, blackish species with hyaline wings having the anterior veins somewhat reddish; halteres sordidly yellow, the extreme tips a little darker; the second joint of the fore tarsus shorter than the third. Length 8 mm.

Head and basal joint of antenna dull black, the flagellum of the latter and the palpi fuscous. Antennal hairs dark reddish brown. Thorax cinereous, with three faintly marked wide cinereous black stripes; scutellum, pectus, pleura and metanotum cinereous. Abdomen black, the posterior margins of the segments cinereous, covered with long brown erect hairs. Genitalia brown, the claspers rather short and stout, the dorsal keel of moderate size. The coxae cinereous; the legs testaceous, the bases of the femora, the knees, the tips of the tibiae, and the middle and hind tarsi a little darker, the fore tarsi except basal half of metatarsus brown and densely bearded with long brown hairs. The fore femora and tibiae and basal half of metatarsi nearly bare; the whole of the middle and hind legs quite hairy. Fore metatarsus about one sixth longer than its tibia; the *second tarsal joint shorter than the third*. The wings narrow and long, hyaline with very slight yellow tinge; the costa, radius, R-M crossvein and the basal half of the media testaceous, the other veins hyaline; venation as figured. Halteres yellowish.

Female. Basal half of antennae yellowish, fore tarsi bare. Readily distinguished from related species by its short second tarsal joint.

Van der Wulp (1877, p.252), suggests that this may possibly be a synonym of *C. pallens* Meigen.

Two male specimens, Chicago, Ill., May, 1899.

22. *Chironomus annularis* Degeer

1776 *Tipula* Degeer. Mem. pour serv. a l'hist. d. Ins. 6:379, 18

1809 *Chironomus* Latr. Gen. Crust. et Ins. 4:250

1818 *Chironomus* Meigen. Syst. Besch. 1:21, 3

- 1850 *Chironomus* Zett. Dipt. Scand. 9:3485, 4
 1864 *Chironomus* Schiner. Fauna Austr. 2:602
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.253, 7
 1804 *Chironomus annulatus* Meigen. Klass. 1:12, 2
 1818 *Chironomus pallens* Meigen. Syst. Besch. 1:22, 5
 1818 *Chironomus tristis* Meigen. Syst. Besch. 1:48, 62

This species resembles *riparius* but differs in having the posterior margins of the abdominal segments grayish, not sharply separated from, but blended into, the black; and in having the third and fourth tarsal joints of the fore legs subequal in length.

Male. Head and antennae blackish, palpi and proboscis fuscous. Dorsum of the thorax cinereous with three dull, black stripes; metanotum, pleura, and sternum dull black, slightly pruinose; scutellum fuscous. Abdomen fuscous or black, the posterior margins of the segments grayish, the hairs yellowish, genitalia small, black. Coxae blackish; legs subfuscous, tarsi slightly darker. Fore metatarsus about one fifth longer than the tibia, the third and fourth tarsal joints about equal in length, the fore tarsi and the middle and hind legs long-haired. The wings hyaline, the anterior veins dark, particularly the crossvein. The venation as figured (pl.28, fig.11). Halteres whitish. Length 7 to 8 mm.

Female. Like the male but the anterior tarsi are bare, and in the single specimen the tips of the femora are darkened. Ithaca, N. Y. A darker variety (var. *tristis* Meig.) with slightly infuscated halteres from Washington State.

I have compared my specimens with specimens from Europe and can detect no differences.

23. *Chironomus dispar* Meigen

- 1830 *Chironomus* Meigen. Syst. Besch. 6:247, 85
 1850 *Chironomus* Zett. Dipt. Scand. 9:3506, 22
 1864 *Chironomus* Schiner. Fauna Austr. 2:604
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.257, 13
 1838 *Chironomus lucidus* Zett. Ins. Lapon. p.810, 5
 1850 *Chironomus* Zett. Dipt. Scand. 9:3509, 25

Shining black; the abdomen somewhat brownish, with paler hairs and occasionally reddish yellow lateral spots; the anal segment narrower and shorter than the preceding segment; the forceps strong, its arms nearly as long as the last abdominal segment. Head black, the palpi brown, the antenna together with its hairs blackish. The legs yellow, the coxae brown; the tibiae brown at the tip, fore tarsi delicately ciliate, the metatarsus one half longer than its tibia. Wings whitish. The crossvein not

darkened. The female has yellow antennae, the abdomen is without spots, and the legs are of a more pronounced whitish yellow. Length, 7 mm. Translation in part from Schiner. New Jersey. (Johnson.)

24. *Chironomus albimanus* Meigen

- 1818 *Chironomus* Meigen. Syst. Besch. 1:40, 45
 1850 *Chironomus* Zett. Dipt. Scand. 9:3551, 77
 1864 *Chironomus* Schiner. Fauna Austr. 2:604
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.268, 38
 1804 *Chironomus annularis* Meigen. Klass. 1:17, 16

Male. Head black, proboscis, palpi and antennae sordidly yellow, basal joint of the last black; antennal hairs brownish. Dorsum of the thorax shining black, sometimes with faint indications of three fine cinereous lines; scutellum, metanotum, pleura and pectus shining black. In immature specimens the thorax is more brownish and the stripes are wider. Abdomen shining black; the anterior segments fuscous; the hairs and the genitalia yellowish, the claspers of the latter slender and short; coxae shining brown or black; legs pale yellowish, apical one half or two thirds of all the femora, the whole of the fore tibiae and the extreme tips of the middle and hind ones black or deep brown; each fore tarsus with its first joint whitish, the others slightly infuscated; anterior legs bare; fore metatarsus $1\frac{1}{2}$ times as long as its tibia. Wings hyaline with a slightly smoky tinge; veins including crossvein yellowish and distinct; venation as figured (pl.28, figs. 12, 13). Halteres whitish. Length 4 mm.

Female. Like the male, but the abdomen is nearly wholly shining black in matured specimens and the veins of the wings seem a little darker. Length 3 mm. Ithaca, N. Y. The American agree perfectly with my European specimens.

25. *Chironomus tenellus* Zetterstedt

- 1838 *Chironomus* Zett. Ins. Lappon. p.812, 15
 1850 *Chironomus* Zett. Dipt. Scand. 9:3517, 34
 (Pl.21, figs. 1 to 4)

Larva. The larva is pale red, 4 to 5 mm. in length. Head brown, about 1.5 times as long as wide, with a few small dorsal setae. Antenna (fig.4) short, about three fourths as long as the mandibles, the basal segment being three fifths of the total length. The labrum (fig.1 ulr.) has upon its lower surface the normal three pairs of large setae and three pairs of smaller ones. The epipharynx (fig.1) has the usual lateral arms (la) with the dark colored extremities, the transverse comb with 5 or 6 blunt, rather indistinct teeth, and the stout curved pectinate hairs. The mandible (fig.1 md) is stout, with blackened teeth, a longitudinal

row of hairs on the dorsal side (not shown in the figure) overhanging the teeth, a long prominent seta on its lateral surface, and a few long much branched setae on the dorsal surface of the mesal margin. The maxilla (fig.1 mx) has a short stout palpus, a few short setae and papillae and a group of delicate mesad projecting filaments. The labium (fig.1 l) has a black margin, the middle tooth is rounded, the second laterals are small and closely united to the first laterals. The anterior and posterior prolegs are as usual with the species of *Chironomus*, the claws of the posterior pair are bilobed; caudad of the anal papillae with their tufts of setae, is a conspicuous pair of spines or bristles. The papillae mentioned above are somewhat infuscated at the tip. The anal blood gills are present, though none were discovered on the ventral surface of the eleventh segment.

Pupa. The pupa is brownish, about 4 mm. in length. The two respiratory organs, each composed of numerous white filaments, are conspicuous. The abdominal segments have the microscopic spines covering nearly the whole dorsal surface (fig.3). There are two patches near the anterior margin of each segment, a large discal patch of slightly larger spines, and posterior transverse rows of still larger blunt ones. Between these patches and gradually merging into them are numerous smaller spines. Thus the entire surface is practically covered with microscopic spines of varying sizes, the anterior patches more distinctly separated from the remainder. The lateral fins of the eighth abdominal segment each has the usual four lateral filaments, and terminates in a slightly sinuous spur (fig.2). The caudal fin has the usual fringe of pale matted filaments.

Imago, male and female. Shining black; thorax of the male the same color, that of the female paler with three brown stripes. Antennae yellow, the antennal hairs of the male the same color; palpi yellowish; sternum schistaceous. Abdomen of the male slender, pilose, black, the first and second segments wholly, and the posterior margins of the third, fourth and fifth fuscous, the last three segments, widened and somewhat dilated; genitalia small, resembling those shown on pl.32, fig.8; the inferior lobes with curved setae; the superior lobes in this species are much shorter and without peduncle, pale in color; abdomen of the female stouter, black, paler at the base, pubescent. Wings white, with pale veins, spotless. Halteres white. Legs with the coxae pale yellow, or white, spotless, the middle and hind legs pale haired; the fore legs bare; the fore metatarsus over $11\frac{1}{2}$ times as long as the tibia, and twice as long as the second tarsal joint. The thorax of the female is sometimes wholly brown. Length 3.5 mm. Translation in part from Zetterstedt, loc. cit.

A specimen from New Jersey is doubtfully referred to as this species by Johnson in Smith's catalogue of the insects of New Jersey. Several bred specimens from Ithaca, N. Y.

26. *Chironomus chloris* Meigen

1818 *Chironomus*. Syst. Besch. 1:28, 17

1850 *Chironomus* Zett. Dipt. Scand. 9:3511, 27

1864 *Chironomus* Schiner. Fauna Austr. 2:604

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.256, 12

Length 5.5 to 7.5 mm. Head blackish, antennae and palpi dark brown; antennal hairs in the male brown; paler toward the tip. Thorax shining, blackish green, with black longitudinal stripes, the ground color usually so dark that the thorax appears wholly shining black, as do also the scutellum, metanotum, pectus and pleura; the pectus with light gray pruinose appearance. Abdomen olive green, black toward the caudal end; the anal segment of the male half as long as the preceding segment; the claspers small, slightly broadened at the middle; the hair of the abdomen grayish; after death the abdomen usually becomes wholly black. Legs brownish yellow; the femora, at least the knees, the tips of the tibiae and tarsal joints dark brown, the last tarsal joint wholly darkened; fore metatarsus 1.5 times as long as its tibia; fore tarsi of the male somewhat hairy but not bearded, the posterior legs of both sexes delicately ciliate. Halteres pale yellow, the knobs slightly darkened. The wings when held against the light appear brownish yellow, when held over a dark surface they appear whitish; the veins very pale brown; crossvein not darkened. Translation from V. d. Wulp. loc. cit.

The female has a yellow dorsum of thorax with three black stripes, the scutellum is yellow, and the abdomen sometimes has narrow whitish incisures.

According to V. d. Wulp (1868) this European species also occurs in the United States. Weyenbergh (1874, p.151) says that the larva is almost colorless, and is found upon weeds hanging into the water.

27. *Chironomus devinctus* Say

1829 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 6:150

1859 *Chironomus* Say. Compl. Wr. 2:349

1878 *Chironomus* Ost. Sack. Catl, Dipt. N. A. p.20

(Pl.28, fig.14)

Tergum black, incisures white; feet with black incisures; body dusky; stethidium dusky livid; thorax trilineate and blackish; scutell dull honey yellow, halteres and wings white; tergum brown-

ish black, incisures, particularly those near the base, white; thighs black, anterior (fore pair) pale at base; the others with a white annulus near the tip; tibiae and tarsi white, with black incisures. Length nearly 5 mm. Inhabits Indiana.

Some *Ithaca* specimens, both male and female, agreeing with above description may be more fully characterized as follows: The entire insect has the appearance of being black, and greatly resembles *C. flavicingula* Walker, differing in having white halteres and an unclouded crossvein. The thorax may be described as being wholly blackish with cinereous lines between the usual three black dorsal stripes; scutellum pale brownish. The narrow white posterior margins of the abdominal segments are very distinct and sharply defined. The fore metatarsus is more than $1\frac{1}{4}$ times as long as its tibia. My single male specimen has lost its fore tarsi. The wings are hyaline, all the veins, including the crossvein, pale. *Ithaca*, N. Y.

28. *Chironomus californicus* n. sp.

Male. Head yellowish brown, antennae with the hairs dull yellowish brown, large basal joint blackish; palpi dusky. Thorax opaque, bare, cinereous with three dull grayish or blackish dorsal vittae; humeri more or less yellowish; pleura and pectus gray or blackish; scutellum yellowish or pale brown; metanotum dull black. Abdomen linear, slender, gray haired, lusterless black, apical margin of each segment pale green or yellowish; the last three segments slightly wider, depressed. The genitalia fuscous, short and filiform. Wings white, the crossvein not darkened. The wing surface does not appear uniformly white, but the narrow space on each side of the veins is less purely white by reflected light. Halteres white. Legs white; the coxae grayish; the base and tip of each femur and of each tibia brownish or blackish; the tarsal joints somewhat infuscated. The middle and hind legs pale haired, the fore pair only pubescent; the fore metatarsus about two thirds longer than its tibia; the second tarsal joint about half as long as the metatarsus, the third and fourth but slightly shorter than the second. This species resembles *C. niveipes* Zett. but differs in the coloring of the legs. Length 5 to 6 mm. Pasadena, California.

29. *Chironomus palliatus* Coquillett

1902 *Chironomus* Coq. Proc. U. S. Nat. Mus. 25:95

Male and female. Head, mouth parts, and first joint of antennae dark brown, remainder of antennae livid, the hairs gray; thorax

dark brown, mesonotum opaque, a broad, yellowish median vitta on the anterior half, and a widely separated pair of gray pruinose vittae on the posterior half; abdomen opaque, velvet-black, its hairs yellow; legs yellowish white, front and middle femora, except their apices, also bases of hind femora brownish, middle tibiae tinged with brown, front tarsi only pubescent, front tibiae three fourths as long as their first tarsal joint, hind tibiae and their tarsi in the male densely clothed with rather long hairs; wings hyaline, slightly tinged with yellow, small crossvein not darker than the adjacent veins, third vein (R_{4+5}) almost straight; halteres whitish; length 2.5 to 4 mm. Washington, D. C. Coquillett, loc. cit.

30. *Chironomus pedellus* Degeer

- 1776 *Tipula* Deg. Mem. pour serv. a l'hist. d. Ins. 6:378, 17
 1818 *Chironomus* Meigen. Syst. Besch. 1:28, 16
 1850 *Chironomus* Zett. Dipt. Scand. 9:3535, 57
 1864 *Chironomus* Schiner. Fauna Austr. 2:606
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.259, 19
 1794 *Tipula cantans* Fabr. Ent. Syst. 4:247, 67
 1804 *Chironomus* Meigen. Klass. 1:13, 7
 1805 *Chironomus* Fabr. Syst. Antl. p.45, 34
 1803 *Tipula littoralis* Schrnk. Fauna Boica. 3:74, 2325
 1880 *Chironomus* var. *atricornis* Strobl. Progr. Gymn. Seitenstetten. p.53

Male. Dorsum of the thorax shining black; the humeri with ferruginous or yellowish-green spots, which seem to be the remains of the original ground color; the scutellum and the metanotum also black. The abdomen a beautiful, bright green which becomes paler or more yellowish in dried specimens. The posterior segments flattened, black, or blackish-brown; the forceps quite small and slender. Head and palpi brownish; the antennae brown, its hairs lighter, the basal joint yellow. Legs pale yellowish, in life somewhat greenish; the coxae, the fore knees broadly, the middle and hind knees narrowly brown banded, the tips of the tibiae and the tips of the tarsal joints brownish; the femora and the tibiae of the fore legs of equal length; the fore metatarsus about one fourth longer than its tibiae, and not bearded. Wings whitish, with pale veins; venation as shown on pl.28, fig.16; the halteres pale.

Female. The female has yellow antennae with only black tips; and the humeral spots are more spread out, appearing to crowd the black dorsal patch into longitudinal stripes. Length 5.5 to 6 mm. Wisconsin (V. d. Wulp); New Jersey (Johnson). Several male specimens from Ithaca, N. Y.

31. *Chironomus pedestris* Meigen

1830 *Chironomus* Meigen. Syst. Besch. 6:246, 81

1850 *Chironomus* Zett. Dipt. Scand. 9:3537, 58

1864 *Chironomus* Schiner. Fauna Austr. 2:606

Resembles *C. pedellus*, but the extreme tips of the tibiae are black, the fore femora are entirely black with the exception of the base; and the tips of the knobs of the halteres are black. Length 5.5 to 6 mm. Schiner loc. cit.

Green, shining, thorax and tip of abdomen, black; dorsum of thorax of the male with three wide confluent black stripes; antennae of the male pale brown; wings white; tip of the knob of the halteres blackish; legs pale, the extreme tips of the tibiae, the whole of the fore femora except the yellowish bases are black; the anterior tarsi of the male nearly bare, fore metatarsus about one fourth longer than its tibiae; the male claspers short and slender. The first five abdominal segments in the dried specimens are pale yellow. Everything else as with *C. pedellus* Zetterstedt. New Jersey (Johnson).

32. *Chironomus nigricans* n. sp.

(Pl.21, figs. 5 to 12, and pl.28, fig.15)

Larva. The larvae were collected from the ponds in the vicinity of Cayuga lake, Ithaca, N. Y. They are blood-red, slender, about 12 mm. long, head short, pale brown, edge of the labium and tip of the mandibles black, each eye consisting of a pair of distinctly separated spots, one of these spots being again divided by a fine line. The antennae is slender, about three fourths as long as the mandible, its first joint five sevenths as long as the others taken together (fig.5). The labrum is of the usual form, with about five pairs of curved subapical setae, and a pair of flattened, ventrad-projecting fan-like processes. The epipharynx (fig.10) has a pair of curved, transverse, toothed ridges, a transverse comb (c) composed of five leaf-like parts, each part with four or five pointed lobes. The lateral arms, not shown in the figure, are of the usual form, each having a bilobed extremity, the outer lobe being slender and pointed, the inner one shorter and broader. The three pairs of pectinate setae which are placed within the horseshoe-shaped ridge are conspicuous (fig.10). The mandibles are stout, with black apices, the usual subapical hairs, mesad projecting branched setae, and a pair of slender lateral projecting setae (fig.7). The maxilla has a moderately stout palpus with a slender apical seta, several stout pale setae, some fine hairs near its base, several mesad projecting pointed lobes, and a number of scattered papillae

(fig.6). Upon the hypopharynx (hy) is a pair of slender branched processes besides the usual hairs and papillae. The middle pair of the teeth in labium (fig.6b) are the longest, and the second, third and fifth laterals are longer than the first, fourth and sixth. The setae of the anterior prolegs are pale brown, and rather coarser and more distinct than those of most of the Chironomid larvae (fig.8). The posterior prolegs have the usual bilobed claws of which the two lobes of each marginal claw make a smaller angle with each other than do the central claws (fig.9). Immediately dorsad of the four short and thick anal blood gills is a pair of small setae; the basal nodule upon which each dorso-anal tuft of setae is placed is quite small, about as wide as it is long. The ventral blood gills of the eleventh abdominal segment were not seen in this specimen.

Pupa. (Figs. 11 and 12.) The pupa is greenish brown, about 6 mm. in length, with the usual pair of white thoracic respiratory tufts. The dorsum of the second and third abdominal segments are marked as shown in fig.11. Near the anterior margin of each of segments four, five and six is a transverse row of short but conspicuous dark spines. The epidermis at the base of each spine is brown; the entire dorsal surface of the segment behind this row is microscopically punctate with extremely short spines. Near the posterior margin these spines become somewhat larger, forming an irregular double or triple transverse row. Second segment is like the following segments, but has in addition the usual transverse row of longitudinal ridges on its posterior margin. All these segments have a few pale setae arranged as shown in the figure. The seventh and eighth segments are nearly devoid of markings, though they have a few small setae. The lateral fins of the eighth segment each has the usual lateral filaments, and each ends in a chitinous comb of five teeth (fig.12). The caudal fin has the usual fringe of matted hairs.

Imago. (Pl.28, fig.15.) Male and female, blackish; legs white, male with whitish abdomen. Length 4 to 5 mm.

Male. Head, including palpi, proboscis, antennae and its hairs pale fuscous. Dorsum of the thorax dark brown with three subshining broad blackish stripes, metanotum and pectus blackish; pleura and scutellum a little paler. The hairs of the mesothorax and scutellum yellow. Abdomen white with a greenish tinge, the last three joints including the genitalia sometimes pale fuscous, and occasionally the posterior margins of segments very narrowly darkened. The claspers elongate, the inferior lobes slender and slightly clubbed. Hairs pale. Legs white, the tips of the middle and hind tibiae each with a minute black circular comb with two of its teeth slightly elongated into spurs. Fore tarsi of male,

bare. Wings white with a slight milky tinge; veins colorless, including the crossvein; venation as figured. Halteres white, sometimes with a slight greenish tinge. In an occasional specimen the middle section of each fore femur is brownish.

Female. Like the male, excepting that the abdomen is black or deep fuscous, dull; in well-preserved specimens the posterior margins slightly cinereous; hairs pale. The flagella of the antennae and sometimes the palpi also yellowish. In both sexes the fore metatarsus is about one third longer than its tibia. One bred specimen and a number of captured ones from Ithaca, N. Y.; also some from New Jersey.

33. *Chironomus aberrans* n. sp.

Female. Resembles *C. fallax* n.sp. but is paler. Length 3.5 mm. Head, including antennae, wholly yellow, palpi pale fuscous. Dorsum of the thorax and scutellum yellowish, the three dorsal stripes, pectus and a mark on the pleura, brownish; metanotum dark brown. Abdomen fuscous, the first two and the basal part of the third greenish or yellowish; posterior margins of the other segments indistinctly paler fuscous; hairs pale. Coxae, the knees, the tips of the middle and hind tibiae and of the tarsal joints brown; the apical half of front femora, basal half and the tips of the front tibiae, and the tips of the fore tarsal joints dark brown. Wings hyaline, with a milky tinge; the veins, including the crossvein, yellow; venation as shown on pl.28, fig.17. Halteres white. The fore metatarsus is about one fifth longer than its tibia.

Male. Like the female but differs in having the first four or five abdominal segments, yellowish. Ithaca, N. Y., Pennsylvania, Washington State, New Jersey.

34. *Chironomus lugubris* Williston

1896 *Chironomus* Williston. Trans. Ent. Soc. Lond. p.274

Male. Similar to *C. longimanus* (No. 51), but differs in lacking the brown stripes of the mesonotum, which is uniformly light yellow, in the abdomen being uniformly brown, and in the femora being wholly light yellow. Length 3-4 mm. Williston, loc. cit. Fore metatarsus about $1\frac{1}{4}$ times as long as its tibia. St Vincent Island, West Indies.

35. *Chironomus fumidus* n. sp.

(Pl.28, fig.18)

Male. Fuscous; length 2.5 to 3 mm. Head with palpi, proboscis, and antennae pale fuscous; the basal joint of the last, brown, the second joint yellowish, the hairs pale fuscous. Dorsum

of thorax pale yellowish, pruinose, or with a greenish tinge, with three brown stripes; the scutellum yellow; the metanotum, sternum (and sometimes the pleura also) dark brown. Abdomen dark brown or black, subshining, sometimes the segments with a suggestion of a pruinose margin; hairs pale brown. Legs yellow, the knees and the tarsi somewhat infuscated; tips of the tibiae blackish. Legs hairy, including the fore tarsi; fore metatarsus nearly twice as long as the tibia, the second and third nearly subequal in length, the fourth but little shorter, the fifth shortest. Wings hyaline, sometimes slightly smoky, anterior veins yellow, the crossvein but little if any darker. Halteres pale yellow.

Female. The head with mouth parts and antennae (except the apical joints) more yellowish, thoracic stripes sometimes more reddish, and the abdomen a blackish green; anterior tarsi bare; in other respects like the male.

This species differs from *C. halteralis* Coq. in having pale halteres and the female having a blackish green abdomen. From *C. longipes* Staeger, an European species, it differs in having shorter tarsi. Ithaca, N. Y., July and August.

36. *Chironomus tendens* Fabricius

1794 *Tipula* Fabr. Ent. Syst. 4:243, 47

1805 *Chironomus* Fabr. Syst. Antl. p.39, 7

1818 *Chironomus* Meigen. Syst. Besch. 1:34, 30

1850 *Chironomus* Zett. Dipt. Scand. 9:3525, 45

1864 *Chironomus* Schiner. Fauna Austr. 2:605

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.257, 15

1899 *Chironomus* Johnson, in Smith's Cat'l. of N. J. Ins. p.627

Dorsum of the thorax shining reddish yellow, with three wide ferruginous longitudinal stripes, which occupy nearly the whole of the dorsum; the median one abbreviated posteriorly, and only continued in an embossed yellow line to the scutellum; pectus, metanotum and scutellum ferruginous. Abdomen yellow or yellowish green; white-haired; the anterior ends of the segments and on the dorsum of the posterior segments somewhat darker; the forceps slender and strongly upcurved. Head yellow; antennae with the shaft brown, the basal joint and the hairs ferruginous; palpi brownish. Legs pale yellow, sometimes the tip of the tibiae and of the tarsal joints slightly darkened; fore tarsi of the male more or less thickly haired; metatarsus one fourth longer than the tibia. Wings whitish yellow; halteres yellow. The female is wholly shining ferruginous, with rather deeply yellow tinged wings. Length 6.5 to 7.5 mm. Schiner, loc. cit. New Jersey (Johnson).

37. Chironomus lineatus Say

- 1823 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 3:14, 5
 1859 *Chironomus* Say. Compl. Wr. 2:42, 5
 1828 *Chironomus lineola* Wiedemann. Aussereurop. zweifl. Ins. 1:17, 6
 1878 *Chironomus* Osten Sacken. Cat'l. Dipt. N. A. p.21
 1899 *Chironomus lineola* Wied. Johnson in Smith's Cat'l. of Ins. N. J. p.626

Wings white; stethidium yellowish testaceous, a fuscous longitudinal line on the anterior dilated line.

Thorax pale greenish, the dilated lines yellowish testaceous, a longitudinal narrow line very distinct and fuscous on the anterior dilated line, and green rather obsolete behind; scutel pale; wings immaculate; feet whitish, incisures of the knees of the intermediate and posterior feet brown; tergum greenish, posterior margins of the incisures dusky. Length of the female nearly three tenths of an inch (7.5 mm.). Pennsylvania. Say, loc. cit. New Jersey (Johnson).

38. Chironomus albipennis Meigen

- 1830 *Chironomus* Meigen. Syst. Besch. 6:248, 87
 1850 *Chironomus* Zett. Dipt. Scand. 9:3526, 46
 1864 *Chironomus* Schiner. Fauna Austr. 2:608
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. 257, 14
 1899 *Chironomus* Johnson, in Smith's Catalogue of Ins. of N. J. p.627

Shining ferruginous; thorax with three chestnut longitudinal stripes; a spot on each pleuron and the metanotum more or less brown; the scutellum yellow. The abdomen green, in dried specimens brownish above, the anal segments flattened, the forceps short and sub lanceolate, the arms incurved, and hairy. Palpi and antennae brown, the hairs of the latter lighter at the tip. Legs pale yellow, the tarsal joints usually darkened; sometimes the extreme tips of the tibiae are also darkened; fore tarsus of the male delicately but distinctly haired, its metatarsus an eighth longer or at least as long as its tibia. Wings white, the costal veins of the female ferruginous, the crossvein not darkened. Halteres pale. Length 5 to 6 mm. A specimen from New Jersey is doubtfully identified as this species by Johnson (1899).

I have a purchased specimen, collector unknown, bearing the label *C. albipennis*, Riverton, N. J., but which in reality is not *albipennis*, but is *C. nigricans* n. sp.

39. Chironomus taenionotus Say

- 1829 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 6:149
 1859 *Chironomus* Say. Compl. Wr. 2:349
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Female. Stethidium green trilineate; a black line on the middle of the anterior line. Body bright pea-green; head yellowish, terminal joint of the antennae blackish; thorax with three dilated, pale honey yellow vittae; a black line along the middle of the anterior one; wings white; metathorax pale honey yellow; with a blackish spot in the middle, divided by a green line; tergum immaculate; pectus pale honey yellow; feet pale greenish, anterior tibiae and tarsal incisures dusky. Length more than one fifth inch (=5mm.). Indiana. Say, loc. cit.

40. *Chironomus fulvus* n. sp.

Larvae collected in Beebe lake near the shore in August; reddish yellow in color. Length about 5 mm. The empty larval skin was subsequently lost, hence no further description can be given.

Pupa. A single pupa from which emerged a specimen so greatly resembling the species described below that I believe them to be identical. This pupa had very much elongated respiratory organs; nearly as long as the body, the main trunk flattened, slender, diminishing in diameter toward the end, the apical end subdividing into three or four branches. Each abdominal segment with a transverse row of rather conspicuous spines near the posterior margin, and a number of long setae, three or four pairs of which are laterals, one or two pairs discal, and a marginal pair, all as shown on pl.22, fig.20. The lateral fin of the eighth segment is provided with a somewhat sinuous yellow spur a little caudad of the middle. The caudal fin is fringed with the usual flattened matted filaments, those more caudad being longer and broader than the others (pl.22, fig.23).

Imago. (Pl.28, fig.19). Deep yellow; wings hyaline, yellow tinted. Length 3 to 4 mm.

Female. Head yellowish, occiput dusky, palpi, antennae and proboscis subfuscous; the base of the second joint and sometimes the basal joint and some of the intermediate joints of the antenna yellowish. Dorsum of the thorax pale yellow, with a whitish sheen, with three testaceous stripes, the middle one divided by a fine line. Humeri whitish, scutellum and part of the pleura yellow, the remaining parts of the thorax reddish yellow. Abdomen reddish yellow, the more posterior segments brownish, the posterior margins of the segments a very little, if any, paler; hairs yellow. Coxae and legs yellow, the fore legs excepting the middle section of the femora, and the whole of the middle and hind tarsi excepting the basal half of the metatarsi, fuscous. Tips of middle and hind tibiae with minute black comb. Wings hyaline, with a slight yellow or dusky tint; anterior veins including the crossvein yellow; venation as figured. Halteres pale yellow.

lowish, sometimes with a slight greenish tint. In immature specimens the parts described above as dusky are more yellowish. The fore metatarsus is about three fourths longer than the tibia. Numerous female specimens. One bred specimen believed to be the same, the pupa of which is described above. Ithaca, N. Y.

41. *Chironomus flavus* n. sp.

(Pl.22, figs. 1 to 4; pl.28, fig.20; pl.32, fig.12)

Larva. No eggs were found. The larvae were taken in company with *Thalassomyia fusca* from the surface of the rocks washed by swift flowing water. Some specimens of the larvae found in August were placed in still water, and in due time transformed and emerged, so that it appears that this species will live in still water also. The full grown larva is pale yellowish green, with pale brown head. Length 6 to 7 mm. and quite slender. The head is rather short, pale brown, the eye spots each consist of a pair of contiguous spots, conspicuously black, and the black ends of the mandibles show prominently. There are several setae upon the head, one in front, one close to but mesad of the eye and a pair on top of the head between the eyes; besides these there is a transverse row of about 6 setae a little distance back of the eyes. The antennae (pl.22, fig.1a) are slender, about the length of the mandibles; the first joint is about three fifths of the whole length, the white apical process of the first joint is nearly as long as the four apical joints taken together. The two apical processes of the second joint are about as long as the third joint. The labrum has about six pairs of rather prominent pale setae, some of them pectinate, and a pair of short pale fan-like processes at the apex. The mandibles (fig.1 md) are stout and have a densely black tip; the maxilla (fig.1 mx) has a prominent palpus, a pair of exceedingly delicate slender mesad projecting processes with several setae. The epipharynx has the usual pair of lateral arms, a transverse comb composed of three hand-like processes, and the curved pectinate hairs. The hypopharynx (fig.1 hy) has the usual papillae. The labium has a conspicuous black margin with the two middle teeth longest, the first laterals much smaller, the second laterals larger than the first, those laterad gradually decreasing in size outwards. The anterior prolegs have numerous curved hairs, the posterior pair (fig.2) with numerous prominent bilobed hooks. The ninth abdominal segment (fig.2) has the normal dorsal tufts of setae, four pale blood gills, of which the apical two thirds of each is considerably smaller in diameter and pointed at the apex. Dorsad of the upper pair is a pair of rather prominent setae.

Pupa. Pale yellow, with yellowish brown thorax; length 3.5 to 4 mm. Thoracic respiratory tracheae are delicate, much branched, and white in color. The second and third abdominal segments (fig.3) each are marked with an anterior transverse row of caudad projecting short setae, the disk more or less covered with smaller and more delicate ones, leaving a number of round clear spaces. The fourth and fifth are like the third, the following ones with fewer setae. The first is bare, the second has besides those mentioned the usual transverse row of black, longitudinal ridges. The anterior lateral margin of the anterior segments is marked with a pale brown cloud, most easily seen in the empty pupal skin. The lateral fin of the eighth abdominal segment has the usual filaments, each fin terminating in a toothed process, deep brown in color (fig.4). The caudal fin has the usual fringe of matted hairs.

Imago, male. Yellow; length 2 to $2\frac{1}{2}$ mm. Head with proboscis, palpi, and basal joint of antenna yellow; antennal flagella and sometimes tip of proboscis pale fuscous. Thorax with all its parts pale yellow, the dorsum with three deeper yellow stripes. In some specimens the metanotum, parts of the pleura and the pectus somewhat deeper yellow. Abdomen wholly pale yellow, with whitish hairs; in living specimens the abdomen is sometimes pale yellowish green; genitalia (pl.32, fig.12) long and slender and yellow in color; the claspers long, the superior lobes blunt with curved spines, the inferior lobes very slender and with an elongate apical seta each. Legs wholly pale yellow, and excepting the first pair rather hairy. Tips of the tibiae with the usual minute black combs. The fore femur is about one third longer than its tibia, and the fore metatarsus is about $1\frac{3}{4}$ as long. Wings hyaline, with a slight milky tinge, veins colorless; venation as shown on pl.28, fig.20. Halteres white.

Female. Like the male, but the antennae are yellow, apical joints are fuscous. The abdomen has a faint suggestion of white margins on the segments. In some specimens the dorsal stripes are quite indistinct; in living specimens the thorax is sometimes a greenish yellow and the abdomen bright green. This species must not be confused with *Tanytarsus exiguus* which it closely resembles, but from which it may be distinguished by its distinct radial veins and hairless wings. Ithaca, N. Y.

42. *Chironomus brevitibialis* Zetterstedt

1850 *Chironomus* Zett. Dipt. Scand. 9:3537, 59

1864 *Chironomus* Schiner. Fauna Austr. 2:606

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.261, 22

1898 *Chironomus* Lundb. Videnskab. Meddel. p.273, 51

This pale green species resembles *C. viridis*, but is smaller; the thoracic stripes, the sternum and the metanotum pale ferruginous, sometimes subobsolete; the claspers of the male quite long and slender; the legs pale yellow or white; the femora sometimes slightly greenish; the extreme tip of the tibiae and of the metatarsi and the whole of the last tarsal joints brownish. Well-colored specimens, with distinct ferruginous thoracic stripes, have the legs more greenish, and the fore legs brownish. The fore tibia is one third shorter than the femur and the fore metatarsus nearly twice as long as its tibia; the remaining tarsal joints are much shorter; fore tarsi are bare; the hind legs are hairy. Halteres and wings white. Length 3.5 to 4.5 mm. Translation from V. d. Wulp. Greenland (Landbeck); Washington State; Long Island. N. Y.

43. *Chironomus modestus* Say

1823 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 3:13, 3

1828 *Chironomus* Wied. Aussereurop. zweifl. 1:18, 8

1859 *Chironomus* Say. Compl. Wr. 2:41, 3

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Larva. (Pl.22, figs.8 to 12). The larva is buff-colored or yellow, with a slight reddish tinge; length 6 to 7 mm. The head is brown with a few dorsal setae; antennae (fig.9) slender, as long as the mandibles, basal joint three fifths of the whole length. The labrum (fig.10 nlr) with a few prominent pale setae, several hairs of which are pectinate. The epipharynx with the usual pectinate setae, lateral arms and transverse comb, the last with but five blunt rounded teeth. Mandibles (fig.11) with blackened teeth. Maxillae (fig.11 mx) with short palpus, several setae and a small group of mesad projecting slender lobes. Labium (fig.11 l) with rounded margin, the teeth with rounded outline, and a pair of ventral setae. Posterior prolegs with bilobed claws, anal blood gills distinct; the posterior dorsal tufts of setae are each placed upon a papilla which is about as broad as long, and which has a very delicate seta on its side.

Pupa. Pale green, length 5 to 5.5 mm. Respiratory organs consist of a pair of tufts of white filaments. Dorsal surface of the fourth abdominal segment (fig.12) marked with two transversely oval patches of microscopic setae near the anterior margin and a large patch with few clear spaces covering the greater portion of the dorsum; this patch is widest at the posterior margin. The third, fifth and sixth segments are similarly marked, but the patches are smaller on the fifth and sixth, and larger on the third; the seventh and eighth are usually bare; the second has the usual transverse row of longitudinal ridges on its posterior margin, and the dorsal surface is marked like that of the

third, though the setae near the posterior margin appear a little more prominent. Near the posterior ventral margin of the first, the anterior and posterior ventral margins of the second, and sometimes on the anterior margin of the third also there is a row of rather long, slender, conspicuous, pale setae. Each lateral fin of the eighth segment has the usual set of four pale filaments and a brownish yellow slightly sinuous tooth (fig.8). The caudal fin has the usual fringe of filaments. The dorsal surface of the first, second and third segments is frequently slightly gray clouded.

The larva and pupa of this species have also been described by Dr Dyar (1902, p.57) from Bellport, N. Y.

Imago, male. Stethidium yellowish, abdomen pea green. Eyes black; antennae, shaft brown, whitish at the base; humerus, scutellum and intervals between the dilated lines of the thorax pale; wings immaculate, costal edge near the tip somewhat dusky; feet greenish white, anterior tibia and the tarsi dusky. Length one fifth of an inch (=5 mm.). Pennsylvania (Say); New Jersey (Johnson); Ithaca, N. Y.

To Say's description, given above, may be added the following: The female is like the male, but the antennae are more yellowish and the abdomen more deeply green. The fore tarsi of the male are nearly bare; the fore femur is about one third longer than the tibia, while the metatarsus is about five sixths longer. The male genitalia are figured on pl.32, fig.8, those of the female in fig.11.

There appear to be several varieties of this species, differing slightly in the adult state, and more distinctly in larval and pupal stage. It is possible that when these and closely allied species are better known, my varieties will be considered distinct species.

Var. a. Larva reddish. The fourth abdominal segment of the pupa as shown on pl.22, fig.15; the lateral fin of the eighth segment with comb of several teeth (pl.22, fig.16). The imago differs principally in being smaller, in length not exceeding 3 mm., while the smallest specimens of the typical variety are over 3.5 mm. in length. In color, too, they are more deeply green, including the thorax and legs. The wing venation is as shown on pl.29, figs.1 and 2.

Var. b. The pupa differs from those of the preceding varieties principally in being devoid of spurs at the end of the lateral fin of the eighth segment. The dorsal surface of segments 5 to 9 is marked as shown on pl.22, fig.14. The imago is about 3 mm. in

length; the longitudinal stripes of the thorax rather faint; the male genitalia as shown on pl.32, fig.9; the lateral arms prolonged, curved upwards and enlarged at the ends; the inferior lobes slender, about one half as long as the outer pair, with a slight enlargement at the end; the superior arms are still shorter and curved; the dorsal keel is elongate, curved downwards, and with a slight notch near the tip. Both of these varieties from Ithaca, N. Y.

44. *Chironomus fulviventris* n. sp.

Larva. Slender, head brown, tip of the mandible and edge of the labium black; each eye consists of two distinct spots. Antennae short, stout, basal joint four sevenths of total length; the appendage at the apex of the first joint longer than the four apical joints. Labrum and epipharynx resembles that of *decorus* n. sp., the transverse comb like that shown on pl.22, fig.19; the lateral arms prominent and uniformly brown. Mandibles and maxillae normal; the labium has the middle pair of teeth shorter than the first and second laterals (pl.22, fig.24). The ventral blood gills were not discovered; the four anal gills longer than the anal prolegs; the other appendages normal.

Pupa. The pupa has the dorsal surface of the abdomen marked like that shown on pl.21, fig.11; the terminal spines of the lateral fins of the eighth segment are shown on pl.22, fig.26. The caudal fin has the usual fringe of matted hairs.

Imago. Male, deep yellow; length, 3 to 4 mm. Head yellowish, palpi, proboscis and antennae pale fuscous, the basal joint of the last yellow, its hairs yellowish brown. Dorsum of thorax yellowish with 3 wide testaceous stripes, the middle one divided by a fine line; mesonotum and pectus reddish brown; scutellum and pleura yellowish, the latter with some blotches, reddish brown. Abdomen brownish, the anterior and posterior margins of each segment yellowish. Last 3 segments broadened, all hairs yellowish brown. The genitalia have a pair of elongate lateral arms, a pair of blunt clubbed inferior lobes with curved setae, a pair of hook-like superior lobes and a downward curved keel (one half of these parts are as shown on pl.32, fig.10). The coxae, the femora, particularly the apical half, the basal half of the fore tibiae and the immediate bases of the middle and hind tibiae, the tips of all tibiae, and all tarsal joints yellowish brown; the remaining parts more yellowish or whitish; all hairs pale, fore tarsi bare. The wings hyaline, all the veins pale. Halteres white.

Female. Like the male, but the abdomen is nearly uniformly yellow. In both sexes the fore metatarsus is only about one eighth longer than its tibia. Specimens of larva, pupa and adult, from Saranac Inn, N. Y.; several adults from Ithaca, N. Y.

45. *Chironomus pallidus* n. sp.

(Pl.29, fig.5)

Male. The thorax yellow; abdomen whitish; length 4 to 4.5 mm. Head yellow, including two basal joints of antennae; proboscis and palpi fuscous or subfuscous; the flagellum of the antenna dusky yellow. Thorax ferruginous, the scutellum, the humeri, space in front of the scutellum and between the ferruginous dorsal stripes is yellowish or whitish; metathorax testaceous, brown or sometimes blackish. Abdomen white; yellowish or pale greenish toward the tip. Genitalia white. Legs white, tip of fore femur, base and tip of fore tibia, blackish; extreme tips of middle and hind tibiae each with a minute black comb; the knees of middle and hind legs sometimes slightly infuscated. Fore metatarsus about one quarter longer than its tibia; fore legs nearly bare, middle and hind ones rather hairy. Wings hyaline, veins nearly colorless. Halteres white.

Female. Antennae yellow with apical joint fuscous. Abdomen pale greenish. Ithaca, N. Y. July and September.

46. *Chironomus frequens* n. sp.

(Pl.29, fig.7)

Differs from *brevitibialis* (No. 42) in that the fore metatarsus is only one third longer than its tibia, the tibia more than three quarters as long as its femora. The face and palpi are yellowish in some specimens. The apical one third of the fore tibia and of the metatarsus, the third fore tarsal joint, the whole of the fourth and fifth joints of all the feet, and the tips of all the other tarsal joints, blackish. The tips of the second and third tibiae each with a minute black comb. The paler portion of tibia and metatarsus is white. In other respects the two descriptions correspond. Length 3.5 to 4 mm. Many female specimens. Ithaca, N. Y.

47. *Chironomus viridis* Macquart.1834 *Chironomus* Macq. Suit. à Buffon. 1:52, 211838 *Chironomus* Meig. Syst. Besch. 7:6, 1271850 *Chironomus* Zett. Dipt. Scand. 9:3531, 531864 *Chironomus* Schiner. Fauna Austr. 2:6051877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.258, 171895 *Chironomus* Johnson. Proc. Acad. Nat. Sc. Phil. p.3201767 *Tipula*? *virens* Linn. Syst. Nat. ed. XII. 2:975, 341838 *Chironomus vulneratus* Zett. Ins. Lapon. p.814, 28

Male. Dorsum of the thorax greenish yellow, with three ferruginous longitudinal stripes as with *C. tendens*. The sternum, a spot on the pleura and the metanotum ferruginous. Abdomen a beautiful light green; on the dorsum, particularly

toward the posterior end, somewhat darker; the posterior segments somewhat flattened; the forceps moderately long and strong. Head yellowish, palpi brown, antennae brown, with its hairs lighter, the basal joint yellow. Legs pale yellow; the extreme tip of each tibia brown; the tarsi toward the end somewhat darker; the foremost pair delicately haired, but not bearded; the fore metatarsus one third longer than its tibia; occasionally the fore tibiae and tarsi darkened; the femora, however, are usually somewhat greenish. The fore femora and fore tibiae are of about equal length. Wings whitish, with pale veins.

Female. The antennae are yellow and have brown tips. Length, 5.5 to 6.25 mm. Translation from Schiner loc. cit. Florida (Johnson).

48. *Chironomus dux* n. sp.

(Pl.29, fig.8)

Larva. The blood-red larva resembles in structural detail that of *C. modestus* (pl.22, figs. 9 to 11). The labium differs in having the second lateral tooth smaller than the third; somewhat resembling fig.1 on pl.21, but the second lateral is more distinctly separated from the first.

Pupa. The pupa has the dorsal surface of the fourth, fifth and sixth abdominal segments marked somewhat like that shown on pl.22, fig.15. The second and third segments are more widely covered with microscopic setae, leaving here and there small, circular, bare spots. The terminal comb of the lateral fin of the eighth segment resembles that shown on pl.22, fig.16, but the comb stands out more nearly at right angles with the long axis of the body, and the teeth are somewhat curved caudad.

Imago, male. Length 5 to 6 mm. Bright green. Head and proboscis and basal joints of palpi pale green, the apical joints of palpi slightly infuscated. Basal joint of antenna yellow, the flagellum fuscous, the hairs brownish. Dorsum of thorax with its three stripes, the metathorax, the sternum and a few spots on the pleura buff-colored; the humeri, space between the dorsal stripes, space in front of the scutellum, the scutellum and the pleura, green. Abdomen green with pale hairs. Genitalia yellow. Coxae and femora green, middle and hind tibiae greenish or yellowish, fore tibiae yellowish, slightly infuscated. Tarsi fuscous, the metatarsi slightly paler. Middle and hind legs rather hairy; fore legs nearly bare. Fore metatarsus about one third longer than its tibia; wings hyaline, the anterior veins yellow, the crossveins the same color; venation as figured. Halteres green.

Female. Slightly darker than the male. Dorsal stripe of the thorax more brownish, tibiae slightly infuscated, especially the front pair; and the extreme tips of the femora also show a trace of brown. Ithaca, N. Y.

49. *Chironomus viridicollis* V. d. Wulp1858 *Chironomus* V. d. Wulp. Tijds. v. Ent. 2:161, 21877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.254, 91898 *Chironomus* Johnson, in Smith's Cat'l. of Ins. N. J. p.627

Male and female. Thorax green, shining, black, striped; abdomen fuscous; legs yellowish green, the knees and the fore tibiae black; the fore tarsi of the male bare, male anal appendages small and slender. Length 6.75 to 9 mm.

Antennae and palpi dark brown, the antennal hairs of the male yellowish gray. Thorax shining, bright green; the dorsal stripes (of which the middle one is divided by a fine line), two or three spots at the root of the wing, the sternum, and the metanotum, brownish black. Abdomen shining, blackish, with yellow hairs; the posterior margins of the segments appear light gray, and a longitudinal dorsal stripe sometimes becomes visible. The last abdominal segment of the male is not as long as the preceding, its appendages are filiform, pointed, not longer than the eighth segment. Legs greenish yellow; the tip of the fore femur, the entire fore tibia, the knees of the last pair of legs, the tips of the tibiae of the last pair of legs, the tips of the first two joints of all the tarsi, and the whole of the last tarsal joint of all the legs, brownish black. The fore metatarsus is about $1\frac{1}{2}$ times as long as its tibia, the next tarsal joint is one half as long as the metatarsus, the third and fourth are still shorter, and of about equal length, the fifth is the shortest. The fore tarsi of the male are not hairy. The last pair of femora and tibiae are pale haired. Halteres with a pale peduncle and a greenish head. Wings almost hyaline, the costal margin with a brownish tint, the veins brownish, the anterior ones darker; the crossvein somewhat darkened. Translation from V. d. Wulp, loc. cit.

Reported by Johnson from New Jersey. A number of specimens from Ithaca N. Y., cannot be distinguished from the European species. The wing venation is as shown on pl.29, fig.9.

50. *Chironomus jucundus* Walker1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:161878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Male. Wings bare; chest red, with a broad black stripe on each side; scutcheon black; abdomen yellow, hairy; hind borders of the segments and the whole of the latter segments, black; feelers tawny, and adorned with tawny hairs; legs pale yellow, hairy; tips of shanks brown; wings white; veins pale yellow; poisers white. Length of body, $2\frac{1}{2}$ lines (5 mm.); of the wings, 4 lines (8 mm.). Georgia. Walker, loc. cit. New Jersey (Johnson, 1899).

51. Chironomus longimanus Williston

(Pl.29, fig.10)

1896 *Chironomus* Will. Trans. Ent. Soc. Lond. p.274, 3

Male. Head yellow. Antennae, save the basal joint, black or deep brown, the plumosity grayish black. Thorax light yellow; a blackish brown stripe, running from in front of the root of each wing, and joining in the middle in front, forming a V-shaped figure; below these stripes the sides of the mesonotum are of a purer yellow; the metanotum and a spot below the halteres blackish. Abdomen yellow; a black band on the posterior margin of the first and second segments; the fourth segment, the posterior, or greater part of the fifth segment, and the hypopygium, black or dark brown. Legs yellow; the base and tip of the four posterior femora, and the proximal end of their tibiae brown; front legs much elongate, the metatarsi about one fourth longer than their tibiae. Wings nearly hyaline. Legs, 3 to 4 mm. Williston, loc. cit. St. Vincent Island, West Indies.

52. Chironomus lobiferus Say1823 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 3:12, 11859 *Chironomus* Say. Compl. Wr. 2:41, 11828 *Chironomus lobifer* Wied. Aussereurop. zweifl. 1:16, 41878 *Chironomus* Ost. Sacken. Catl. Dipt. N. A. p.21

Larva. Blood red; length 14 to 15 mm. Head dark brown, each eye consists of two distinctly separated spots; the antennae are about three fifths as long as the mandibles, brownish in color, the basal joint about five ninths of the whole length, the remaining joints slender (pl.23, fig.2). The mandibles, labrum, and epipharynx resembling those of *C. decorus*. The setae of the epipharynx pectinate. The teeth of the transverse comb as large as in *C. decorus* but not all are of the same length. The maxilla and the labium are as shown on pl.23, fig.3; the toothed margin of the latter being deep black. The setae of the anterior pair of legs are curved and hair-like. The anal prolegs have the usual bilobed claws; the four anal blood gills are short, about three times as long as wide; the caudal setae are as usual.

Pupa. The pupa has plumose respiratory filaments; the markings of the dorsum of the abdominal segments consists of a uniformly distributed area of microscopic spines. The lateral fins of the eighth segment (pl.23, fig.5) has the usual lateral filaments, and each terminates in a very small comb of about seven teeth. The caudal fin bears the usual fringe of matted filaments.

Imago. Antennae yellowish brown; thorax pale cinereous, the three lines testaceous; scutellum and metathorax testaceous; wings white, with a brownish obsolete point near the middle; pectus testaceous; feet pale yellowish, tergum somewhat glaucous, the

segments with their bases and an obsolete longitudinal line black; on the middle of the base of the second, third, fourth and fifth segments is a small, longitudinally oval, slightly elevated lobe, extending nearly one-third the length of the segment. Length three tenths (≈ 7.5 mm.). Inhabits the United States. Say, loc. cit.

The larvae and pupae were collected by Mr C. S. Banks at Albany N. Y. The imago was not bred, but from nearly mature pupae it was determined that on the dorsal surface of the posterior margin of each abdominal segment excepting the last is attached a spiked mace-like appendage (pl.23, fig.4) which extends one third the length of the segment following. On the anterior segments this lobe is somewhat smaller and shorter. As it lies closely applied to the dorsal surface of the segment it appears as if it were a nodule of that segment rather than a process from the segment preceding. The imaginal colors could be distinctly seen through the pupal skin, agreeing with the description given above.

53. *Chironomus festivus* Say

- 1823 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 3:13, 2
 1828 *Chironomus* Wied. Aussereurop. Zweifl. Ins. 1:16, 5
 1859 *Chironomus* Say. Compl. Wr. 2, 41
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Body pale, when recent, light green; pectus, three thoracic lines and scutel testaceous; wings white. Body pale yellowish brown, when recent, pale green; head at base of the antennae testaceous; antennae light brown; eyes deep black; thorax trilineate with testaceous, scutel testaceous; wings white, immaculate; pectus testaceous between the two anterior pairs of feet; feet pale, hairy; thighs green; tarsi dusky at the incisures; anteriors nearly naked, with hairy tarsi; abdomen, second, third, fourth and fifth segments tipped with blackish above. Length of female $7/20$ of an inch (9 mm.). Observed particularly in Illinois. Say, loc. cit.

Wiedemann describes both male and female, but gives the length as 6.5 mm. A male specimen bearing the label *C. lineola* Wied., Westville, N. J., agrees with the above description of *festivus*, and I believe it to be the latter. In this specimen the fore metatarsus is about 1.4 times as long as its tibia, and the fore tarsi are provided with long hairs. This species seems to be closely related to *C. tendens*

54. Chironomus willistoni nom. nov.

1896 *Chironomus* sp. Will. Trans. Ent. Soc. Lond. p.275, 6

Male. Light yellow, the antennae brownish, and, rarely, the posterior part of the abdomen also brownish. Extreme tip of the four posterior tibiae black; front metatarsi about one fourth longer than their tibiae. Wings hyaline; anal angle only feebly indicated. Length 2 to 2.5 mm. Williston, loc. cit. St Vincent Island, West Indies.

55. Chironomus anonymus Williston

1896 *Chironomus* Will. Trans. Ent. Soc. Lond. p.274, 2

The larvae are described by Dr H. G. Dyar (1902). They are bright red in color, and possess the four ventral blood gills of the eighth segment. The mouth parts are not described. The pupa is of the usual type. Both larvae and pupae were found in a rain-water barrel at Bellport, N. Y.

Imago, male. Head red, or reddish yellow, the front more yellow. Antennae brown, first joint red; plumosity at the tip blackish. Mesonotum light brownish red; two stripes and the humeri yellow; scutellum light yellow. Pleura light brownish or reddish yellow. Metanotum brown. Abdomen blackish, the first segment and the distal part of the next two or three segments yellow or yellowish. Legs yellow; the immediate tip of the tibiae and the tip of all the tarsal joints dark brown; proximal end of the front tibiae also brown; front tibiae about one half the length of their metatarsi, and not longer than the second joint. Wings nearly hyaline. Length 4 to 5 mm. Williston, loc. cit. St Vincent Island, West Indies.

A male specimen from Illinois differs from a St Vincent co-type specimen in being paler, in having the thoracic stripes, pleura, metanotum and sternum pale reddish yellow or buff colored, the remaining parts greenish yellow, the abdomen as described, the paler parts with a greenish tinge.

56. Chironomus innocuus Williston

1896 *Chironomus* Will. Trans. Ent. Soc. Lond. p.274, 5

Male. Head and basal joints of the antennae light yellowish; palpi brown; antennae brown. Thorax light yellow; mesonotum with a brown stripe in the middle in front, and, on either side, an oval brown spot, the three separated, and the middle stripe bisected by a slender yellow line. Scutellum light yellow. Metanotum brown; halteres brown. Abdomen black, with black hair;

the seventh and eighth segments light yellow, with yellow hair. Legs light yellow; the extreme tips of the four posterior tibiae black; distal joints of the front tarsi infuscated, as also the front tibiae; front metatarsi about one third longer than their tibiae. Wings hyaline. Length 3 to 4 mm. Williston, loc. cit. St Vincent Island.

57. *Chironomus similis* n. sp.

(Pl.29, fig.13)

Resembles *C. cristatus* Wied.; differs in being smaller and in having proportionately longer fore metatarsi. Length 3 to 4 mm.

Male and female. Head brownish, palpi and antennae including basal joint dark brown, antennal hairs of the male yellowish brown. Thorax dusky yellow, the three dorsal stripes and sternum brown, scutellum yellow, metanotum blackish. Abdomen brown, posterior margins of the anterior segments widely yellowish, with cinereous bloom; anterior margins narrowly yellowish, the brown marking prolonged caudad along the middle line; posterior segments almost wholly brown with cinereous bloom. Legs yellow or yellowish brown, knees and tarsi sometimes a little darker. Fore metatarsus three fourths longer than the tibia; fore tarsi nearly bare; middle and hind legs hairy. Wings hyaline, veins yellow, crossvein brown though not very prominent. Halteres yellow. Chicago, Ill., Brookings, S. D., and Ithaca, N. Y.

58. *Chironomus redeuns* Walker

1856 *Chironomus* Walker. Ins. Saunders, I. Dipt. p.422

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

1900 *Chironomus* Coq. Proc. U. S. Nat. Mus. 22:250

Female. Wings bare. Tawny. Antennae brown, tawny at the base. Thorax with four brown stripes, the outer pair paler, broader and shorter than the inner pair. Abdomen brown, with a hoary band on the hind border of each segment; under side tawny. Legs testaceous; tips of the femora, of the tibiae and of the joints of the tarsi brown. Wings limpid; veins brown, strongly defined; discal mark distinct. Halteres testaceous. Length of the body 3 lines (=6 mm.); of the wings 5 lines (=10 mm.). United States. Walker, loc. cit. Puerto Rico and Mississippi (Coquillett, loc. cit.).

59. *Chironomus plumosus* Linne

1758 *Tipula*. Syst. Nat. ed. X. p.587. 19

1761 *Tipula*. Fauna Succ. ed. II. p.434, 1758

1767 *Tipula*. Syst. Nat. ed. XII. 2:974, 26

- 1804 *Chironomus* Meigen. Klass. 1:11, 1
 1818 *Chironomus* Meigen. Syst. Besch. 1:20, 1
 1850 *Chironomus* Zett. Dipt. Scand. 9:3481, 1
 1864 *Chironomus* Schiner. Fauna Austr. 2:601
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.249, 1
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21
 1805 *Chironomus annularis* Latr. Hist. Nat. d. Crust. et d. Ins.
 14:289, 1
 1818 *Chironomus grandis* Meigen. Syst. Besch. 1:21, 2
 (Pl.29, fig.11)

The larva and pupa were obtained from the swamps in the vicinity of Cayuga lake, Ithaca, N. Y. No adults were reared, although several were captured in the neighborhood. The extremely large size of the larva and pupa, together with the coloring of the latter, lead me to believe that my specimens are the early stages of *C. plumosus*. In fact the only species which has been taken here in a number of seasons collecting which is large enough to have larva and pupa of this size is *plumosus*, and I therefore shall tentatively so consider it.

Larva. Blood red, length of body about 22 mm. Head brown, antenna short and stout, basal joint about half as long as the mandible; the latter with blackened teeth and with the usual mesad projecting setae. Labrum, epipharynx and hypopharynx were destroyed. Maxilla with short palpus and a mesad projecting lobe with setae and papillae as shown in fig.16 of pl.23. Labium (pl.23, fig.15) broad with short blunt teeth; the middle tooth broad with a nearly straight apical margin, the first lateral small and more or less rounded, the second lateral broad and a little longer than the middle one; the third pair smaller and closely united with the second; fourth, sixth and seventh laterals about of equal size with rounded margins, the fifth slightly smaller. Anterior prolegs with very numerous fine hair-like setae. Ventral and anal blood gills present. The larva (4) mentioned by Garman (1888) is probably this species.

Pupa. Grayish brown in color; the markings of the enclosed imago visible; length about 16 mm. Respiratory filaments much branched and whitish in color. The dorsum of the abdominal segments uniformly covered with microscopic spines, those nearest to the posterior margins of the segments a little stouter than the others. The lateral fin of the eighth segment terminates in a chitinous process or spur, the extremity of which is divided into 7 or 8 spines in close contact (pl.23, fig.14). Caudal fin with the usual fringe of matted filaments. The mutilated condition of the larva and pupa renders further description impossible.

Imago, male and female. Dorsum of the thorax dull pale yellow, with three blackish gray, wide, longitudinal stripes, middle one posteriorly, the lateral ones anteriorly abbreviated; in front of the scutellum with a shining whitish gray spot; pleura near the coxae darkened, with grayish sheen; metanotum gray. Abdomen pale yellowish, each segment with a broad brown spot, which often widens into cross bands, the last few segments and the sides of the others in certain lights with whitish gray sheen, the hairs pale yellow; the last few segments flattened, the anal one with its incisure deep, the forceps brownish yellow, slender. Head yellowish; antennae brown, the hair is light brown; palpi ferruginous, often quite dark. Legs yellow, the knees darkened, the other articulations, narrow blackish brown; fore tarsi of the male with long hairs; metatarsus one fourth longer than the tibia; middle and hind legs delicately but long and thickly haired. Wings whitish with a black spot. The female quite robust, colors darker, abdomen brown, with gray reflections, the incisures appearing at most slightly whitish, the antennae yellow, at the end brownish. The coloring of this species is variable, sometimes lighter, sometimes darker, occasionally it has a touch of ferruginous, which is then particularly noticeable on the antennal hairs; on the whitish-gray posterior segments of the abdomen often appear regularly arranged brown markings. The metamorphosis of this species was first described by Reaumur. Length, 11 to 12 mm. Schiner, loc. cit.

Brought from Mackenzie river by R. Kennicott (Ost-Sack., loc. cit.). Reported from Chautauqua lake N. Y., by C. V. Riley (1886). Some male and female specimens from Ithaca N. Y., and Washington State, agree with the description and with specimens from Europe in all particulars.

59a. *Chironomus ferrugineovittatus* Zetterstedt.

1850 *Chironomus* Zett. Dipt. Scand. 9:3492

1864 *Chironomus* Schiner. Fauna Austr. 2:602

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.251

Male and female. Head yellow, the antennae and palpi brown, antennal hairs of the male dusky yellow, antenna of the female yellow with a brown apical joint. Thorax pale yellow, with three broad ferruginous longitudinal stripes, pleura with ferruginous spots; pectus and metanotum gray; the flattened area in front of the scutellum with a whitish sheen. Scutellum as also the abdomen of the male for the most part yellowish, both with a suggestion of green; upon some of the abdominal segments a brown dorsal mark; the posterior segments with a whitish sheen;

the anal segment cordate, a third shorter than the one immediately preceding; forceps brownish yellow, slender and pointed; the hairs on the sides yellowish; abdomen of the female dark gray, with whitish incisures. Legs yellow with brownish articulations; the last two tarsal joints darkened; tarsal proportions as in *plumosus*; male fore tarsi hairy. Halteres yellow. Wings with a slightly yellow tinge, whitish in reflected light; the cross vein dark brown. Length 9 to 12 mm. Washington State.

60. *Chironomus decorus* n. sp.

(Pl.23, figs. 7 to 13; pl.29, fig.12)

Larva. The larvae were found everywhere in the ponds and ditches around Ithaca N. Y. They are blood red, and about 12 mm. long. The head is dark blackish brown; the antennae are short, normal. The dorsal sclerite is narrow ovate, posterior end pointed, truncate anteriorly, with three setae along each lateral margin, the first at the extreme anterior end, the last one half way between the anterior and the posterior end, the second midway between these. Articulated to the cephalic margin, and overhanging the mouth opening is the labrum. There are two pairs of prominent setae upon its dorsal surface; numerous papillae, two of which are quite prominent on the anterior margin and upon the anterior ventral surface. The arrangement of the setae and the armature of the epipharynx shown in fig.10. The epipharyngeal comb (c) has relatively long and uniform teeth; the lateral arms are dark brown in color. Each eye consists of two distinctly separated pigment spots. The mandibles (fig.7) are black-tipped, with a fringe of apical setae, a prominent lateral spine, and a group of mesad projecting branched setae; the hypopharynx has its usual papillae upon the fore margin; the maxillae are prominent, each with two lateral setae, the palpus is short and thick. The labium has a black margin with an outline as shown in fig.8. In many specimens the teeth appear to be slightly longer in proportion than shown in this figure. The anterior prolegs have very numerous curved setae. The body is nearly devoid of even minute setae. The anal prolegs are normal, claws dark, bilobed. Anal setae as usual. The eleventh body segment has four long white blood gills on the ventral surface, and caudad of the dorsal setae of the twelfth segment are four short ones.

The larva (1) mentioned by Garman (1888) is probably this species.

Pupa. Dusky greenish brown, the colors of the imago showing through the integument. Length 7 to 8 mm. Tracheal filaments prominent, white and much branched. Thorax with a few scat-

tered setae. Segments of the abdomen with a seta-pattern as shown in fig. 11 and 12; the pattern more indistinct on the last two segments. On each lateral margin of the fifth to the eighth segment there is a brown longitudinal dash, most conspicuous and half the length of the segment on the fifth. The black chitimized lateral spur of the eighth segment is prominent and without teeth (fig.12). The anal appendage has the usual fringe of matted hairs.

Imago, male. Length 6 to 7 mm. Head yellow, antennae and proboscis more or less brownish, large basal joint of the antennae and the palpi reddish brown, the latter sometimes fuscous. Thorax greenish yellow with a whitish sheen, the pleura and the scutellum the same color; the three thoracic stripes, some pleural spots, the metathorax and the pectus dull testaceous or reddish, sometimes even brownish; the middle dorsal line divided by a fine line. Abdomen hairy, pale yellow or greenish yellow, in life more distinctly green, infuscated toward the tip; each segment with a brownish transverse fascia slightly in front of the middle. These fasciae are widest on the dorsal line, and are obsolete on the last few segments. Genitalia brownish yellow, hairy, moderately elongated (pl.32, fig.13). Legs including the coxae pale greenish yellow, short haired; tarsi, particularly towards the tip, infuscated; tips of tibiae and of all tarsal joints fuscous, fifth joint wholly fuscous. Tarsal claws simple, pulvilli small, empodium stout, curved, blunt, and pectinate on the convex side. The fore metatarsus about 0.6 longer than its tibia. Wings hyaline, cross-vein conspicuously clouded with dark brown, anterior veins yellow, posterior ones hyaline, the two branches of the cubitus and the anal vein accompanied by a faint brown streak. Venation as shown on pl.29, fig.12.

Female. Differs from the male as follows: Slightly shorter, antennae yellow, last joint fuscous; thorax more greenish than yellow, abdomen greenish with dark bands as in the male, but the bands are always wider and usually cover the whole surface of the segment excepting the apical third or fourth. In other respects like the male. This species seems to be very common in many parts of the country. New York, Ohio, Illinois, Iowa, Kansas, Washington State, and Nebraska.

60a. *Chironomus dorsalis* Meigen

1818 *Chironomus* Meigen. Syst. Besch. 1:25, 10

1850 *Chironomus* Zett. Dipt. Scand. 9:3529

1864 *Chironomus* Schiner. Fauna Austr. 2:605

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.255

1880 *Chironomus cingulatus* Meig. Syst. Besch. 6:245

- 1850 *Chironomus* Zett. Dipt. Scand. 9:3498
 1834 *Chironomus nigroviridis* Macq. Suit. Buffon. 1:51
 1850 *Chironomus* Zett. Dipt. Scand. 9:3529
 1839 *Chironomus venustus* Staeger. Kröj. Nat. Tidsskr. 2:562
 1850 *Chironomus* Zett. Dipt. Scand. 9:3496
 1864 *Chironomus* Schiner. Fauna Austr. 2:603
 1847 *Chironomus waldheimii* Gimmerth. Bul. Soc. Imp. Nat. Moscou. 20. 2:142, 69

Larva and pupa. Miall and Hammond (1900) state that the larva is blood red, and possesses both the ventral blood gills of the eleventh segment and the anal blood gills of the twelfth. The labium is as shown on pl.23, fig.1. The pupa is of the usual type, resembling the one shown on pl.16, fig.2. The abdominal markings and the spurs of the lateral fin of the eighth segment are not described.

Imago, male and female. Head yellowish; palpi and antennae dark brown, the last usually yellowish or reddish yellow at the base, the antennal hairs of the male pale brown with reddish yellow sheen; very dark varieties (var. *nigroviridis*) dark brown with pale brownish sheen. Thorax yellow, yellowish green, sometimes very pale green; the thoracic stripes, the pleura and the sternum chestnut, sometimes ferruginous, sometimes blackish; the metathorax always blackish brown; the middle thoracic stripe of the male divided by a fine depressed line, in the female more distinctly separated. Abdomen of the male a translucent green or yellowish green; the second and the following segments each with a large blackish brown dorsal mark which frequently is in the form of a cross band; the last segments are wholly blackish brown, with a whitish shimmer; abdomen of the female blackish brown with pale green pruinose margins to the segments. Legs pale green or yellowish; tips of the tibiae and of the tarsal joints brown; the fore metatarsus 1.5 times as long as the tibia, and nearly twice as long as the second joint; the following joints gradually diminishing in length; the fore tarsi bare. Halteres yellowish. Wings hyaline, the veins pale brown, the crossvein usually slightly clouded. Length 5.75 to 7.5 mm. Connecticut, Pennsylvania, South Dakota, Kansas.

61. *Chironomus stigmaterus* Say.

- 1823 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 3:15, 6
 1859 *Chironomus* Say. Compl. Wr. 2:42, 6
 1828 *Chironomus glaucurus* Wied. Aussereurop. zweifl. 1:15, 3
 1878 *Chironomus* Ost. Sack. Catl. Dipt. N. A. p.20

Tergum pale, toward the tip glaucous.

Male. Antennae pale yellowish brown; thorax pale cinereous, lines very pale testaceous, sometimes tinged with dusky; scutel

yellowish; metathorax reddish brown; wings white with a fuscous subcentral stigma; pectus testaceous; feet pale yellowish; tergum, basal segments pale reddish brown with whitish tips, terminal segments somewhat glaucous. Length 0.3 inch (=7.5 mm.). Habitat United States.

I have seen specimens, which I identify as this species and agreeing perfectly with the above description, from Kansas, Washington State, California, Wisconsin, Idaho, New Jersey and South Dakota. The male has hairy fore tarsi; the fore metatarsus in both sexes is about one-fifth longer than the tibia. The species resembles *cristatus* but differs in having paler thoracic stripes, in being generally paler, and in its metatarsal proportions. From *festivus* and *tendens* it differs in having a darkened crossvein.

62. *Chironomus cristatus* Fabr.

1805 *Chironomus* Fabr. Syst. Antl. 39, 4

1821 *Chironomus* Wied. Dipt. exot. 1:11, 1

1828 *Chironomus* Wied. Aussereurop. Zweifl. Ins. 1:14, 1

1878 *Chironomus* Ost. Sack. Catl. Dipt. N. A. p.20

(Pl.29, fig.14)

Male. Dorsum of the thorax yellowish, with grayish-brown stripes; abdomen yellowish, brown banded. Length 8 mm.

Antennae brownish. The dorsum of the thorax with the usual three stripes, which, however, are not lead-colored, since they lack the metallic lustre, but are brown, and appear in different lights to be covered with a grayish bloom; the pleura have grayish spots, the sternum and the metathorax ash-gray. The brown cross band of each segment of the abdomen lies at the base of the segment; each band is somewhat wider at the middle, where it is somewhat prolonged into a fine line, sometimes reaching the posterior margin of the segment. Legs yellowish. North America. Wiedemann, loc. cit.

According to Fabricius (1805) the head is blackish and the legs pale with blackish articulations. Some male and female specimens from Chicago, Ill., and Ithaca, N. Y., agreeing with Wiedemann's description may be further characterized thus: Face and palpi brown; large basal joint of the antenna brown in the male; in the female the antenna is yellow except the apical joint; scutellum yellowish; the last two or three abdominal segments nearly wholly dark brown with cinereous bloom; male genitalia

dark brown. Legs yellow, knees of the fore legs and the fifth tarsal joint of all the legs pale brown; extreme tips of all the tibiae and of all the tarsal joints dusky; fore metatarsus about 1.5 times as long as its tibia; fore tarsi of male bare. Wings hyaline, veins yellow, the crossvein brown. Length 6.5 to 8 mm. New York, Illinois, Washington, Kansas, Idaho, South Dakota, New Jersey (Johnson).

62a. *Chironomus tentans* Fabricius

1805 *Chironomus* Fabr. Syst. Antl. p.38, 3

1818 *Chironomus* Meigen. Syst. Besch. 1:24

1850 *Chironomus* Zett. Dipt. Scand. 9:3482

1864 *Chironomus* Schiner. Fauna Austr. 2:603

1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.255

1818 *Chironomus abdominalis* Meig. Syst. Besch. 1:32, 25

1804 *Chironomus vernalis* Meig. Klass. 1:13, 5

Larva. Concerning the larva Weyenbergh (1874) writes:

"The larvae were found among the rotting leaves in the water. They were full grown in March and the beginning of April; blood red in color, long and slender in form, and about 20 mm. in length. . . . The mandible is deep brown, chitinized and sharply toothed, particularly the vertex (pl.37, fig.28) is very sharp. The lower lip (labium) is also sharply toothed, the teeth symmetrically placed as shown on pl.37, fig.27. . . . The anal appendages are large. . . ."

Imago, male and female. Length 7.5 to 9.75 mm. Head grayish yellow; palpi dark brown; antennae of the male dark brown, the hairs paler brown, sometimes verging upon ferruginous; antennae of the female reddish yellow, darkened apically. Thorax pale yellow or light green; the moderately wide thoracic stripes, a line produced posteriorly from the median stripe to the scutellum, a part of the pleura and the metanotum, dark gray; the whole thorax especially when viewed from behind, with a whitish sheen. Abdomen dark gray, the segments with whitish or grayish posterior margins; the anal segment of the male short and broad, the claspers bent, *unusually stout*. Legs yellowish, the knees, the tips of the tibiae, and the whole of the tarsi, blackish; the fore metatarsus nearly one half longer than its tibia, the second tarsal joint about half as long as the first and but little longer than the third; the latter but little longer than the fourth; the fore tarsi not ciliate, even the hairs of the hind legs inconspicuous; these legs in both sexes robust. Halteres yellowish. Wings whitish; the anterior veins pale brown, crossvein slightly darker, the other

veins nearly colorless. The thoracic stripes of some specimens are ferruginous; the ground color of the entire insect in this case verges toward green; the antennal hairs of the male is then also mainly pale yellow. In this species the pale thorax contrasts strongly with the dusky abdomen. Translation; V. d. Wulp. loc. cit.

According to Zetterstedt (1850) the ratio of fore metatarsus to tibia is the same as in *plumosus* (i. e. one and one fourth to one). This is the case in specimens from Ithaca, N. Y., Idaho, South Dakota, Utah, Iowa.

63. *Chironomus prasinus* Meigen

- 1818 *Chironomus* Meig. Syst. Besch. 1:22, 4
 1877 *Chironomus* V. d. Wulp. Dipt. Neerl. p.250, 2
 1839 *Chironomus intermedius* Staeg. Kröjer: Naturh. Tids. 2:559, 3
 1850 *Chironomus* Zett. Dipt. Scand. 9:3484, 3
 1864 *Chironomus* Schiner. Fauna Austr. 2:601
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20
 1818 *Chironomus pilipes* Meig. Syst. Besch. 1:26, 13

Resembles *plumosus* but is smaller, the abdomen in living specimens is light green (which color in dried specimens becomes yellowish) with blackish dorsal spots which sometimes spread out in the form of a cross band, seldom wanting; posterior margins of the segments with a whitish sheen; abdomen of the female darker; with greenish white pollinose, posterior margins to the segments. The ratio of tibia to metatarsus, the hair of the legs, etc., like *plumosus*. Length 7.5 to 9 mm. Translation, V. d. Wulp, loc. cit. Northwest of North America. Osten-Sacken (1878). Idaho, Minnesota, New York.

According to Hammond (1885) the larva is blood red, and possesses both anal and ventral blood gills. Judging from a drawing given by him the labium of the larva appears to be like that figured on pl.37, fig.25.

64. *Chironomus polaris* Kirby.

- 1824 *Chironomus* Kirby. Suppl. App. Parry's 1st Voyage. CCXVIII
 1831 *Chironomus* Curtis. Ross' Voyage. LXXVII
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.288

Black, hairy, wings lacteous, iridescent, the costa fuscous with nervures darker, halteres dirty ochre. Length 7.5 mm. Breadth, 12 mm. Curtis, loc. cit.

Lundbeck (1898, 272) says in regard to this species and *C. borealis* Curtis, that they are probably identical with either *C. hyperboreus* or *C. staegeri*. He says further that *C. polaris* of Holmgren is not identical with either of the above-named species, he having seen the Holmgren specimens. In Holmgren's species the fore metatarsus is shorter than the tibia, while according to the figure given by Curtis in Ross' Voyage LXXVII, it appears that *polaris* Kirby is a true *Chironomus* (sens. str.). Arctic regions.

65. *Chironomus attenuatus* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:20

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Male. Body dark gray, thinly clothed with yellow hairs; abdomen very long, fringed with hairs on each side; feelers brown; legs dull yellow, hairy, especially the four hinder thighs and shanks; fore feet very long, hairy at the base; wings slightly gray, with the usual dark spot on each, and having a fringe of very short hairs; veins brown; poisers dark gray. Length of the body 3 lines (=6 mm.); of the wings 5 lines (=10 mm.). St Martin's falls, Albany river, Hudson's bay.

According to the heading of the group to which this species belongs the author states that the wings are hairy. White mountains, New Hampshire (Slosson).

66. *Chironomus crassicollis* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:18

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Male. Body blackish brown, downy; chest thick; abdomen much narrower than the chest; feelers and legs brown; wings white, not hairy, very iridescent; veins pale yellow; poisers brown. Length of the body one line (=2 mm.); of the wings 1.5 line (=3 mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

67. *Chironomus fimbriatus* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:20

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Body brown, hairy, abdomen fringed with hairs; feelers and legs pale brown, the latter hairy; wings colorless, hairy, fringed; poisers pale brown. Length of the body one half line (=1 mm.); of the wings one line (=2 mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

68. Chironomus nigritiba Walker1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:161878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Wings bare; chest black; abdomen yellow at the base; palpi brown; legs yellow; tips of thighs and of shanks, and of joints of the feet, black; wings colorless; a broad brown band across each wing, faint toward the hind border; veins brown; yellow towards the base; poisers lemon-color. Length of body 2.25 lines (=4.5 mm.); of wings 4.5 lines (=9 mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

This species may be the same as *C. brachialis* Coq.

69. Chironomus borealis Curtis1831 *Chironomus* Curtis. Ross' Voyage. LXXVII1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Black, thorax gray, abdomen with 7 whitish rings; costa fuscous; legs lurid. Length, 6 mm. Breadth, 12 mm.

Black, basal joint of the antennae ochreous; thorax hoary; abdomen clothed with long subdepressed yellowish hairs, the margins of the segments shining whitish or silvery; wings lacteous, opalescent, the costa fuscous, the nervures darker; halteres yellow; legs dull castaneous ochre, tips of the thighs and tarsi fuscous. Arctic regions. Curtis, loc. cit. Greenland.

According to Lundbeck (1898) this species may be the same as either *C. hyperboreus*, or *C. staegeri*, though Curtis' description is too brief to admit of a positive statement.

70. Chironomus albistria Walker1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:171878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Male. Body reddish brown; stripes on the chest red or flesh-color; side stripes passing into two broad white stripes; sides of chest hoary; scutcheon pale red; abdomen dark brown, hairy; sutures of the segments paler; feelers pale brown; legs pale tawny, hairy; tips of thighs, of shanks, of feet, darker; wings whitish, not hairy; veins pale yellow; poisers white. Length of the body 3 lines (=6 mm.); of the wings 4.5 lines (=9 mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

71. Chironomus brunneus Walker1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:211878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Male. Wings hairy. Head and chest brown, the latter with the usual three stripes of a pale gray color; abdomen of a yellowish

lowish brown; feelers brown; legs yellowish brown; thighs yellow at the base; wings colorless; veins and poisers yellow. Length of the body 1.75 lines ($3\frac{1}{2}$ mm.); of the wings 3.5 lines ($=7$ mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.; New Jersey (Johnson).

72. *Chironomus lasiopus* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:19

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Female. Wings hairy. Head and chest yellow; the usual three stripes on the latter brown, confluent, and occupying the whole of the back; feelers brown; scutcheon dingy yellow; hind chest black; abdomen brown, with a broad, dingy yellow band on the hind border of each segment; legs clothed with short yellow hairs; thighs yellow; shanks darker; feet brown; wings colorless, with the usual spot on the disk; veins brown, poisers pale yellow. Length of body, 2.5 lines ($=5$ mm.); of the wings, 4 lines ($=8$ mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

73. *Chironomus hilaris* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:17

Male. Wings bare. Body straw-color; head and chest tawny, the latter produced in front, and having its usual three stripes of a yellow color; feelers tawny; eyes black; legs brown; thighs white towards the base; middle shanks pale yellow, excepting the base and the tips; wings white, each having a broad, irregular, brown band across its disk; veins yellow; poisers pale yellow. Length of the body 1.5 lines ($=3$ mm.); of the wings 3 lines ($=6$ mm.). Habitat unknown. Walker, loc. cit.

74. *Chironomus anticus* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:21

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Wings hairy. Chest a little produced in front, silky white, with the usual three stripes of bright tawny color; abdomen pale yellow, hairy; last two segments dull tawny; legs pale yellow, hairy; a tawny band round each hind thigh; tips of the thighs, of the shanks, and of the joints of the feet, tawny; wings whitish from the base to the middle, pale tawny thence to the tips, slightly fringed; poisers pale yellow. Length of body 2.5 lines ($=5$ mm.); of wings 4 lines ($=8$ mm.). Georgia. Walker, loc. cit.

75. *Chironomus bimacula* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:15

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Female. Wings bare; body citron color; chest produced in front, with the usual three stripes of orange color; a black dot

at the tip of each side stripe; feelers brown; legs dingy yellow; wings pale; veins and poisers pale yellow. Length of body 1.25 lines ($=2.5$ mm.); of wings 2.5 lines ($=5$ mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

76. *Chironomus confinis* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:15

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

Male. Pale yellowish green; chest with the usual three lines dull red; the middle stripe divided; hind chest brown; abdomen green, yellowish towards the base, darker at the tip; the sides hairy; feelers brown; legs dull yellow, hairy; wings colorless, hairy; veins pale brown; poisers white.

Female. Chest yellow; middle stripe not divided; abdomen dingy yellow. Length of the body one line ($=2$ mm.); of the wings two lines ($=4$ mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit. In the heading of the group Walker says that the wings are bare.

77. *Chironomus pellucidus* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:21

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Male. Body pale yellowish green; feelers pale brown; abdomen and legs very hairy; wings colorless, hairy, deeply fringed; veins dull yellow; poisers pale yellow. Length of the body $\frac{3}{4}$ line ($=1.5$ mm.); of the wings 1.5 line ($=3$ mm.). St Martin's falls Albany river, Hudson's bay. Walker, loc. cit.

78. *Chironomus trichomerus* Walker

1848 *Chironomus* Walker. List Dipt. Brit. Mus. 1:21

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Male. Wings hairy. Pale greenish yellow; sides of abdomen fringed with hairs; eyes black; feelers and legs yellow, the latter thickly clothed with short hairs; wings whitish, deeply fringed; poisers pale yellow. Length of the body one line ($=2$ mm.); of the wings two lines ($=4$ mm.). St Martin's falls, Albany river, Hudson's bay. Walker, loc. cit.

79. *Chironomus* sp.

(Pl.23, fig.13)

In the figure mentioned above is shown the labium of a blood worm found in Fall creek, Ithaca N. Y., in the quiet water. This labium resembles that of *Chironomus decorus*, but the teeth are considerably longer.

80. Chironomus sp.

1896 *Chironomus* Osborn. Bul. Iowa Exp. Station. p.405

The larvae were found in the city water at Boone, Iowa. The larva is figured and briefly described by Osborn, loc. cit. It is blood red, possesses the four ventral blood gills of the eleventh segment as well as the anal gills. The figure shows the labium with the middle tooth shorter than the first laterals; the last laterals longer than those immediately preceding (pl.37, fig.26, after Osborn).

81. Chironomus sp?

(Pl. 22, fig.7)

Yellow larvae 6 or 7 mm. long from Saranac Inn N. Y. Head pale yellow, tip of mandible and labium black. The labrum, antennae and epipharynx resemble that of *Orthocladus* shown on pl.25, fig.3. The lateral surface of the mandible is not wrinkled; the maxillae and the labium are as shown in pl.22, fig.7. The setae of the anterior prolegs are delicate, curved and apparently not pectinate. The posterior appendages resemble those shown on pl.25, fig.6.

82. Chironomus sp.

(Pl.22, fig.22)

Larvae from Saranac Inn and from Ithaca N. Y. Blood red; length 8 to 10 mm.; resembling the larvae of *C. flavicinctigula*. Differ in having the middle pair of teeth of the labium paler than the laterals.

83. Chironomus sp.

A blood worm from Beebe lake, Ithaca N. Y.; resembles the larva of *C. flavicinctigula* in form, size, color, shape of prolegs, and appendages, etc. but differs in the form of its labium, there being an even number of teeth arranged as shown on pl.23, fig.6.

84. Chironomus sp.

The larvae (collected at Saranac Inn N. Y.) construct loose, black, cylindrical cases composed of sand, decaying leaves, etc. These cases are about four times as long as wide. The length of the larva is about 10 mm.; the maxillae resembles that shown on pl.22, fig.7. The margin of the labium is as shown on pl.22, fig.21. The eyes are each composed of two distinctly separated spots.

85. Chironomus sp.

1900 *Chironomus* Pettit. Mich. Acad. Sc.

The larvae are pale green in color, and very small and slender. They were found to mine in the water-lily leaves. The insect works by tunneling or plowing a furrow which extends from the

top of the leaf to the lower epidermis. This tunnel is often several inches in length and winds about in all directions in a serpentine manner. . . . From the front end of this tube the insect extends its head and feeds. . . . The pupae are apple-green in color, as are also the adults. Michigan.

Five species of larvae of *Chironomus* have been described by Garman (1888). Of these No. 1 is probably identical with *C. decorus*; No. 4 with *plumosus*; the others are described below.

86. *Chironomus* sp. Garman

1888 Garman. Illinois State Lab. Nat. Hist. Bul. 3:160

Larva No. 2. Length about 10 mm. Head pale brown, under side black. Two eye specks. Labium with four teeth on each side; median tooth shorter than the two next it. Hairs of anterior pediform appendage rusty. A pair of small club-shaped (respiratory?) appendages at posterior edge of the penultimate segment. Anal papillae conspicuously enlarged distally. Illinois.

87. *Chironomus* sp. Garman

1888 Garman. Illinois State Lab. Nat. Hist. Bul. 3:160

Larva No. 3. Length about six mm. A single eye speck. Posterior segments without fleshy respiratory appendages. Anal papillae apparently jointed. Illinois.

88. *Chironomus* sp. Garman

1888 Garman. Illinois State Lab. Nat. Hist. Bul. 3:160

Larva No. 5. A very small pupa (3 mm.) taken in August still retained its larval skin, the labium of which differs from that of the preceding larvae in lacking the median tooth. Its condition would not permit of more extended comparison with the others, and it may prove the same as (3).

Genus 39. *Cricotopus* V. d. Wulp

Tijdschr. v. Entom. XVI (LXX) and XVII. 132

Larva. Small, yellowish or green in color, the anterior abdominal segments stouter than the posterior ones. Eleventh segment without ventral blood gills. Antennae, labium, epipharynx and labium essentially like those of *Chironomus*. Maxilla with a number of mesad and cephalad projecting blades (pl.24, fig.1 *mx*). Mandible frequently transversely corrugated on its convex surface (pl.24, figs. 4 and 6). The anterior feet frequently with coarse pectinate setae.

Pupa. The thoracic respiratory organs are simple, tube-like, sometimes with enlarged extremities. Abdominal segments with minute and short setae. The anal segment with 6 terminal setae, three on each side.

The larvae and pupae of *Orthocladus* do not seem to differ from *Cricotopus*.

Imago. This genus resembles *Chironomus*, from which it is distinguishable in having the fore metatarsus a half or a third shorter than the tibia. The last abdominal segment of the male is much shorter than the preceding and is broader than long; the claspers are short and broad, and usually white in color (pl.33, fig.2). The legs are white and black annulate, the fore tarsi are bare or covered with very short and inconspicuous hair (in an exceptional case the male has bearded tarsi); the hind tarsi are also usually bare. The halteres are always white or pale yellow. Wings bare, the anal angle, particularly in the male, is prominent; R_{4+5} is straight or slightly bent at its extremity, the crossvein is a little beyond the middle of the wing; the cubitus is forked, the base of the fork a little distad of the crossvein; the lower branch is straight or gently arched toward the hind margin; the humeral crossvein is wanting or rudimentary.

The species of this genus are all small (2 to 4 mm.) and with black and yellow coloring, the dorsum of the thorax has 3 shining black stripes, which sometimes are so wide as to entirely obliterate the yellow dividing lines, so that only the humeri remain yellow.

KEY TO SPECIES OF CRICOTOPUS

Larvae

- a* Sides of each abdominal segment with pencil of long hairs, pl.24, fig.9
3. *trifasciatus*
- aa* Abdomen without such pencils
 - b* Middle tooth of the labium longer than the first laterals, pl.24, figs. 1, 2, 4.....4. *exilis* n.sp.
 - bb* Middle tooth about as long as the first laterals, pl.25, fig.22
6. *varipes*

Pupae

- a* Pattern upon each abdominal segment in two wide transverse bands, resembling that shown on pl.25, fig.7.....4. *exilis* n.sp.
- aa* Not marked in this manner
 - b* Markings as shown on pl.24, fig.7; thoracic respiratory organs as shown on fig.8.....3. *trifasciata*
 - bb* Dorsum uniformly covered with minute spines.....6. *varipes*

Imagines

- a* At least the apical half of the middle and hind femora black
- b* Abdominal segments with narrow white posterior margins; fore metatarsus about one fourth or one third shorter than its tibia
1. *tremulus*
- bb* Abdomen with wide white or yellow fasciae
- c* Abdomen with the first, most of the third, half of the fifth, and posterior margins of the second and the fourth, yellow
2. *geminatus*
- cc* Abdomen not marked in this manner
- d* With the fore metatarsus about one half as long as the tibia
- e* With yellow bands on the first, fourth and seventh segments
3. *trifasciatus* (var. *tricinctus*)
- cc* With yellow bands on the first, fourth and fifth segments
4. *exilis* n. sp.
- dd* With the fore metatarsus about two thirds as long as its tibia
- e* With yellow bands on the first and fourth segments
5. *bicinctus*
- cc* With the first and second wholly, and a part of the third and fourth segments yellow.....6. *varipes*
- aa* Middle and hind femora for the most part yellow or white
- b* With first, fourth and seventh abdominal segments yellow
3. *trifasciatus*
- bb* Abdomen not marked in this manner
- c* Metatarsus of the fore legs about one half as long as the tibia; abdominal segments with yellow margins.....7. *sylvestris*
- cc* Fore metatarsus about two thirds as long as the tibia; abdominal segments with brown posterior bands.....8. *debilis*

NOTE.—Consult also the auxiliary key containing Walker's species, p.198.

In occasional specimens of some members of this genus the part which is usually yellow is found to be black. In this case, however, the black is shining, and easily contrasts with the velvet black of the other parts.

1. *Cricotopus tremulus* Linne

- 1758 *Tipula* Linn. Syst. Nat. ed. X. p.587, 23
- 1767 *Tipula* Linn. Syst. Nat. ed. XII. p.975, 31
- 1804 *Chironomus* Meigen. Klass. 1:15, 11
- 1818 *Chironomus* Meigen. Syst. Besch. 1:45, 56
- 1850 *Chironomus* Zett. Dipt. Scand. 9:3562, 88
- 1864 *Chironomus* Schiner. Fauna Austr. 2:611, 72
- 1884 *Cricotopus* Mik. Wien. Ent. Zeitg. 3:202
- 1899 *Cricotopus* Johnson. in Smith's Catl. Ins. N. J. p.627

Male. Dorsum of the thorax yellow, with wide, posteriorly confluent longitudinal shining black stripes; the pleura sometimes paler with black spot at the base of the wing; the scutel-

lum and the metanotum shining black. The abdomen dull black, basally and at the incisures whitish; anal segment thicker than the preceding one; the forceps white. Head black, the antennae brown, its hairs lighter at the tip. Legs black or brown, anterior coxae, with all the femora at their bases and wide bands on the middle of all the tibiae white; the second and third joints of all the tarsi also white; the fore metatarsus markedly shorter than the tibia. Wings grayish, in certain lights whitish. Halteres white.

Female. Differs from the male in having darker veins in the wings. Length 2 to 3 mm. New Jersey (Johnson).

Translation from Schiner, loc. cit.

2. *Cricotopus geminatus* Say.

1823 *Chironomus* Say. Journ. Acad. Nat. Sc. Phil. 3:14, 4

1859 *Chironomus* Say. Compl. Wr. 2:42, 4

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20

1899 *Cricotopus* Johnson, in Smith's Cat'l. Ins. N. J. p.627

Thorax fuscous; pleura gray; abdomen white, annulate with black. Humerus gray, the color being a continuation of that of the pleura; pectus livid; feet white; thighs blackish, pale at the base; tibia at base and tip, and tarsi at tip fuscous; abdomen with three broad double bands, formed thus: second segment fuscous with the exception of the posterior margin, third segment fuscous on the basal margin, fourth segment fuscous excepting the posterior edge, fifth segment fuscous on the basal half, sixth and seventh segments entirely fuscous. Length 3.20 of an inch (3.75 mm.). Pennsylvania. Say, loc. cit. New Jersey (Johnson).

3. *Cricotopus trifasciatus* Panzer

1813 *Chironomus* Panz. Faun. Germ. p.109, 18

1818 *Chironomus* Meigen. Syst. Besch. 1:42, 50

1850 *Chironomus* Zett. Dipt. Scand. 9:3556, 83

1864 *Chironomus* Schiner. Fauna Austr. 2:610

1818 *Chironomus trineinctus* Meigen. Syst. Besch. 1:41, 49

1850 *Chironomus* Zett. Dipt. Scand. 9:3555, 82

1864 *Chironomus* Schiner. Fauna Austr. 2:610

1874 *Cricotopus* V. d. Wulp. Tijds. v. Ent. 17:132

1877 *Cricotopus* V. d. Wulp. Dipt. Neerl. p.272, 3

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

(Pl.24, figs. 5 to 10; pl.29, fig.15)

Larva. The larva is yellowish with a brownish or reddish tinge. Some are wholly yellow. Length 4 to 5 mm. This larva differs from all others thus far examined in having a bunch of long, fine, pale yellow hairs (pl.24, fig.9) near each lateral margin

of each of the abdominal segments. The hair tufts are about as long as a single body segment, excepting on segments one and two, where they are shorter or entirely wanting. The head is brown, about 1.5 times as long as wide; antennae, labrum, and epipharynx resembling those shown on pl.25, fig.3; the setae at the apex of the labrum longer than shown here. Mandibles (pl.24, fig.6) with a branched basal and two simple dorsal setae; convex side wrinkled. Maxillae (fig.5) with short palpus, a few papillae and a tuft of mesad projecting setae. The labium (fig.5) somewhat triangular, having a toothed outline as shown in the figure. Prothoracic feet with numerous curved yellowish brown setae. Abdominal setae as described above. The anal prolegs and appendages were destroyed in the few specimens which I have.

Pupa. Length 3 to 4 mm. with black and yellow markings of the adult showing through the integument. Each prothoracic respiratory organ is slender, nearly cylindrical, with smooth surface and rounded ends, its length about 0.25 mm. (fig.8.). The markings of the second, third and fourth abdominal segments as shown in fig.7. The fifth, sixth and seventh are similarly though much less plainly marked. The markings on each segment consist of a large area of very minute caudad projecting setae with a few scattered bare patches, a transverse band of stouter caudad projecting setae near the posterior margin and a band of cephalad projecting setae upon the margin. The latter band is particularly conspicuous on the second segment. The caudal appendage is quite small, and is provided with three pale setae on each posterior angle (fig.10, which also shows the male genitalia of the enclosed imago).

Imago, male. Dorsum of the thorax yellow, with three wide nearly confluent shining black stripes; a spot on each pleuron, the scutellum, sternum and the metathorax also black. The abdomen dull black, the first, fourth and seventh segment with pale yellow cross bands; besides this the posterior margins of the other segments narrowly white; anal segment thicker than the others; forceps white. Head yellow; the palpi black; the antennae brown, its hairs white at the tip. Legs black, the fore coxae, the bases of all the femora, a broad band on each tibia whitish; the fore tarsi black or brown, each middle tarsus with its two basal joints, and each hind tarsus with three basal joints white. Metatarsi of the fore legs of the male only one half as long as the tibiae. Wings whitish.

Female. Abdomen more yellowish; one may say, abdomen yellow with three black fasciae, the two anterior ones each divided by the light colored incisures; the legs also with more yellow.

Length 3 to 4 mm. Schiner, loc. cit. (*tricinctus*). North America (O. S.); Ithaca N. Y.; Chicago Ill.

"The variety with less black, the thoracic stripes narrower, and the femora only black at the tip, is known as var. *trifasciatus*". V. d. Wulp (1877).

4. *Cricotopus exilis* n. sp.

(Pl.24, figs. 1-4; pl.29, fig.16; pl.33, fig.2)

Larva. The yellowish green larvae were taken from the rocky bottom of the shallow but swift, Fall creek water at Ithaca N. Y. Length, 4 to 5 mm. In most of its details the larva is like that shown on pl.25, figs. 12 to 15; but I fail to find a seta on each side at the base of the labium. The lateral surface of the mandible is wrinkled (fig.4), and the curved setae of the epipharynx are more prominent (fig.2); neither are the oblique wrinkles below the teeth of the labium present. Claws of anterior prolegs are coarse and pectinate.

Pupa. The pupa is yellowish with black; the colors of the adult showing through the integument. Length about 2 mm. The markings of the abdominal segments resemble those shown on pl.25, fig.7. The caudal appendages consist of the genital sacks and the three setae at the end of each lateral process of the anal segment.

Imago, female. Head, occiput and upper half of front blackish, the narrow horizontal space above the antennae and face bright yellow; palpi brownish; probocis yellow; antennae brown, the two basal joints yellowish, antennal hairs whitish with an occasional black one. Thorax dusky yellow with three wide shining black stripes, the median one much abbreviated behind, and very narrowly divided posteriorly by a yellow stripe, lateral stripes much abbreviated in front. Pleura yellow with 4 brownish spots or bars at base of wings; pectus yellowish brown; scutellum and metanotum black, the latter with a very narrow yellow median line. Abdomen black and yellow, its dorsum with yellow markings as follows: First segment, narrow basal margin of second, very narrow apical margin of third, all of the fourth and fifth except brownish clouds among the marginal setae, sixth, seventh and eighth faintly at base and apex, and all of anal segment; thus leaving most of the second, third, sixth, seventh and eighth blackish. Genitalia white. Sides of abdomen and venter sordidly yellow, darkened apically. Near the posterior margin of each segment there is a row of black setae, excepting on the first segment, where they are paler colored. Coxae yellowish. The basal one fourth of the fore and basal one half of middle and hind

femora, yellow; the remainder of the femora black, but the line of division not sharply marked. Fore tibiae white with black bases and tips; middle and hind tibiae yellow with black tips, and sometimes bases also. Fore tarsi dark brown; middle and hind ones yellowish brown, each joint darkened apically; fore metatarsus about one half as long as its tibia. Wings bare and spotless, veins yellow. Venation as figured. Halteres yellow.

Male. Like the female but with less yellow; antennae brown with yellow basal joints, hairs pale brownish; genitalia white, length 1.5 to 2 mm. Ithaca, N. Y.

5. *Cricotopus bicinctus* Meigen.

1818 *Chironomus* Meig. Syst. Besch. 1:41, 48

1850 *Chironomus* Zett. Dipt. Scand. 9:3553, 81

1864 *Chironomus* Schiner. Fauna Austr. 2:610

1874 *Cricotopus* V. d. Wulp. Tijds. v. Ent. 17:132

1877 *Cricotopus* V. d. Wulp. Dipt. Neerl. p.271, 2

1830 *Chironomus dizonias* Meig. Syst. Besch. 6:252, 101

Head with the antennae and mouth parts black, the antennal hairs of the male whitish at the tip. Thorax shining black with yellow humeral spots (male) or yellow with wide sometimes confluent longitudinal lines (female); scutellum, metanotum, sternum black. Abdomen black, the first and the fourth segments and in the female the venter also, yellow; the claspers of male snow white. Legs black, fore coxae and the bases of the femora pale yellow; each tibia on its middle section, together with the hind tarsi, except the tips of the joints, white; fore metatarsus one third shorter than its tibiae. Wings whitish, the anterior wing veins and the crossveins pale brown (pl.29, fig.17). Length $2\frac{1}{4}$ to 3 mm. V. d. Wulp. loc. cit.

Several specimens from Ithaca, N. Y., agree perfectly with this description. In one or two specimens of the male, the yellow humeral spot is indistinct, and in another it is wanting. In some specimens also the hind legs are pale brown, so that the white tibial ring is conspicuous only on the fore legs. In some female specimens the thoracic stripes are brownish.

6. *Cricotopus varipes* Coquillett

1902 *Cricotopus* Coq. Proc. U. S. Nat. Mus. 25:93

Larva. Yellowish, or with a greenish tinge. The body tapers both toward the head and caudal end; hence the middle body segments are of greater diameter. Length 6 to 7 mm. Head dark brown, labrum, and epipharynx resembling *C. exilis*, the

epipharynx with several pairs of rather stout curved spines, besides several small setae; the lateral arms stout, with black apices. The mandibles wholly black, with the lateral surface faintly wrinkled, apical tooth long and slender. Antennae and labrum as with *C. exilis* and *Orthocladus fugax* (see pl.25, fig.3). The labium and maxillae as shown on pl.25, fig.22. Each eye consists of two spots nearly in contact, the anterior spot much smaller than the posterior. Setae of the anterior prolegs are coarse, curved, but apparently not pectinate. Posterior appendages resembling those shown on pl.25, fig.6.

Pupa. Colors yellow and black. Length about 5 mm. Respiratory organ not discovered in the single specimen in my possession. Dorsum of abdominal segments uniformly covered with minute spines. Anal appendage like that of *C. exilis*.

Imago, male. (Pl.29, fig.18.) Head and its members black, hairs of antennae gray; thorax black, mesonotum highly polished; metanotum and scutellum opaque, velvet black; abdomen velvet black, the first two segments and the hind margins of the following two polished yellow; genitalia yellow; femora black, the extreme bases and trochanters yellow, front tibiae and tarsi brown, the former with a broad median white band, other tibiae and tarsi yellow, their apices brownish, legs only pubescent, first joint of front tarsi two thirds as long as the tibiae; wings whitish hyaline; small crossvein slightly darker than the adjacent veins, R_{4+5} almost straight; halteres yellow; length 2.5 mm. Great Falls, Md. Coquillett, loc. cit.

Female. Like the male excepting for sexual characters. The white band on the fore tibiae is nearer the base than the tip, so that the black at the basal articulation is much less than at the apical end. The yellow margins of the third and fourth abdominal segments are quite narrow, and nearly wanting in some specimens. The thorax of the female is more brownish, polished, with pleura and humeri paler, sometimes yellowish. Male and female from Saranac Inn, N. Y., Ithaca, N. Y., Washington State.

7. *Cricotopus sylvestris* Fabricius

- 1794 *Tipula* Fabr. Ent. Syst. p.252, 89
- 1805 *Chironomus* Fabr. Syst. Antl. p.47, 46
- 1818 *Chironomus* Meigen. Syst. Besch. 1:43, 53
- 1850 *Chironomus* Zett. Dipt. Scand. 9:3558, 85
- 1864 *Chironomus* Schiner. Fauna Austr. 2:611
- 1874 *Cricotopus* V. d. Wulp. Tijds. v. Ent. 17:132
- 1877 *Cricotopus* V. d. Wulp. Dipt. Neerl. p.274, 8
- 1899 *Cricotopus* Johnson, in Smith's Cat'l. Ins. N. J. p.627

1826 *Chironomus triannulatus* Macq. Recueil Soc. Sc. Agri. Lille. p.202, 30

1838 *Chironomus* Meigen. Syst. Besch. 7:9, 139

1804 *Chironomus vibratorius* Meigen. Klass. 1:16, 13

Male. Dorsum of the thorax yellow, with three black stripes, often confluent posteriorly, a spot on each pleuron, the scutellum, sternum and the metanotum shining black. The abdomen black, the base and the incisures yellowish or whitish, the incisures of the fourth and fifth segments usually wider, fascia-like; in fact the markings of the abdomen somewhat variable; the anal segment wide; the forceps white. Head brownish yellow; the palpi darker; antennae brown, its hairs lighter at the tips. Legs black, the fore coxae and femora narrowly white at the bases, each tibia with a wide white or yellow band at the middle, middle femora with the bases widely yellowish, hind femora whitish to the tip; fore tarsi all black or brown; middle tarsi to the third, the hind tarsi to the fourth joint whitish; metatarsus of the fore leg about one half as long as its tibia. Wings whitish; venation as figured (pl.29, fig.19).

Female. The female has the base of the abdomen and the venter yellow, the incisures being whitish. Length 2 to 3 mm. Schiner, loc. cit. New Jersey (Johnson). Some specimens from Chicago, Ill., agree perfectly with the above descriptions.

8. *Cricotopus debilis* Williston

1893 *Orthocladus* Will. Trans. Ent. Soc. London. p.275
(Pl.29, fig.20)

Male. Red or reddish yellow. Plumosity of the antennae brownish-black. Mesonotum with three shining brown spots or stripes, narrowly separated. Abdomen slender; each segment with brown posterior band. Legs yellow; front femora brown on distal end; front tibiae light yellow on the proximal half or two fifths, dark brown on the distal portion, about one third longer than the corresponding metatarsi; front tarsi infuscated; the four posterior femora somewhat infuscated distally. Wings hyaline. Length 2.5 to 3 mm. Williston, loc. cit. St Vincent Island.

I have examined a cotype specimen of this species now in the Cornell university collection, and find that it should be included with *Cricotopus*, instead of with *Orthocladus* as Professor Williston has it; unless, as the Abbe Kieffer has already pointed out, *Cricotopus* should be considered as a synonym of *Orthocladus*.

Genus 40. *Camptocladius* V. d. Wulp

Tijdschr. v. Entomol. XVI (LXX); XVII, 133

Resembles in most respects *Cricotopus*; the fore metatarsus is shorter than its tibia; the anal segment of the male is short and broad, the claspers white with white hairs. Legs unicolorous, at least not white and black annulate. The halteres of most of the known species are dark. Wings bare, R_{4+5} is bent upwards, sometimes short and ending noticeably before the end of the costa, or running close to it for a distance, the cell R_{4+5} therefore quite broad; the crossvein usually on or proximad of the mid length of the wing; the cubitus forked, the base of the fork usually noticeably distad of the crossvein; the lower branch sinuous (pl. 30, figs. 1 to 4). Usually small black species from 1.5 to 3 mm. in length. In other respects like *Chironomus*.

The larvae of some species have been found in dung. According to Arribalzaga the palpus in *Camptocladius* has but one joint; in all the species that I have seen there are four joints as in *Chironomus*.

KEY TO SPECIES OF CAMPTOCLADIUS

Imagines

- a* Thorax with more or less yellow
 - b* Abdomen and thorax yellow, the latter with three wide blackish lines; wings slightly hairy (Greenl.) 1. *graminicola*
 - bb* Abdomen pale fuscous, or fuscous
 - c* Anterior crossvein is about one third the wing length from the base; thorax yellow, black-striped; abdomen pale fuscous, more yellowish anteriorly; legs yellow; length 1.5 mm.; female
2. *Camptocladius* sp.
 - cc* Anterior crossvein is two fifths wing length from the base; abdomen fuscous; length 2 mm. 3. *fumosus* n. sp.
- aa* Thorax wholly black
 - b* The crossvein is noticeably proximad of the fork of the cubitus
 - c* Fore metatarsus about one third shorter than its tibia
 - d* R_{4+5} not parallel to the costa, the cell above it quite distinct; wings hyaline, whitish; length 2 mm. 4. *aterrimus*
 - dd* R_{4+5} long, and curves so as to be nearly parallel to the costa, nearly obliterating the cell above it, especially toward the apex; wing often with a slightly smoky tint; body subshining; no black dash at the base of the wing; length 1.5 mm.
7. *minus*
 - cc* Fore metatarsus about one half as long as its tibia
 - d* Fore legs pubescent, middle and hind ones sparsely short pilose; palpi black, thorax black, lightly cinereous, with two rows of yellowish hairs; wings white; length 1.75 to 2.25 mm. (Greenland) 5. *pumilio*
 - dd* Not as described above

- c* The posterior branch of the radius ends far before the tip of the wing; wing milk white with a short black bar at its base; antennae of the male with pale hairs; length 1.5 to 2 mm.6. *bysinnus*
cc R_{4+5} moderately long; peduncle of the halteres pale; wing milky white; antennae and palpi black (Greenland)...8. *parvus*
bb Crossvein but little if any proximal of the fork of the cubitus. Greenland species
c Middle legs very pilose.....9. *velutinus*
cc Middle tibiae and tarsi nearly bare.....10. *extremus*

NOTE—Compare also the auxiliary key containing Walker's species on p.198

1. *Camptocladius graminicola* Lundbeck

1898 *Chironomus* Lundbeck. Vidensk. Meddel. p.278, 59

1902 *Camptocladius* Kertész. Cat'l. Dipt. 1:214

Male. Thorax yellow, subshining, with three blackish brown stripes, the middle one posteriorly, the lateral ones anteriorly abbreviated; the pleura yellow, the pectus blackish brown, scutellum yellow, metathorax brown. The abdomen yellow, with yellow hairs, toward the tip sometimes a little darkened. The antennae yellow or pale brown, the palpi yellow. The legs also yellow or pale brown. The halteres yellow; the wings white, the anal lobe moderately produced, obtuse-angled, the veins pale, toward the costal border a little darker. The vein R_{4+5} is straight, the costa is produced a little beyond the tip of the wing, *M* is almost straight, and runs into the tip of the wing, the cubitus forks under the crossvein, its upper branch enters the wing margin under the tip of R_{4+5} ; its lower branch is suddenly deflected. The middle and hind legs are yellow pilose, the fore pair pubescent, the anterior metatarsus a little shorter than the tibia.

Female. Similar to the male, but shorter, and also paler in color; the antennae shorter than the thorax, the abdomen pale yellow, the posterior margins of the segments darker, the wings wider, and finally, the tip of the wing very thinly haired. Greenland. Lundbeck, loc. cit.

The male has a few very indistinct hairs upon its wing near the apex; the hairs upon the wing of the female are rather more conspicuous. Lundbeck, loc. cit.

From this statement it appears that this species might with propriety have been classed with *Metriocheilus*.

2. *Camptocladius* sp.

(Pl.30, fig.1)

Female. A single specimen from Lake Forest Ill. resembles the next species, *C. fumosus*, but differs in being paler or more yellowish, and in having the small crossvein at about one third the wing length from the base. Length 1.5 mm.

3. *Camptocladius fumosus* n. sp.

(Pl.30, fig.2)

Male. Fuscous. Head and palpi dusky yellowish, occiput grayish; antennae wholly fuscous, the hairs brown. Dorsum of thorax with three wide subshining black or dark brown stripes, the anterior margin, the humeri, the narrow lines separating the dorsal stripes, and the pleura yellow, the scutellum brownish yellow; sternum and metanotum subshining brown or blackish. Abdomen and genitalia uniformly fuscous, with pale hairs. Legs pale fuscous, the bases of the femora yellow. Hairs pale. Front metatarsus about one half as long as its tibia. Wings hyaline with a yellowish tinge; the fork of the cubitus is beyond the crossvein; tip of R_{4+5} is rather close to the tip of the wing and distad of the extremity of Cu_1 . Halteres yellow. Length 2 mm. Ithaca N. Y.

4. *Camptocladius aterrimus* Meigen

- 1818 *Chironomus* Meigen. Syst. Besch. 1:47, 59
 1839 *Chironomus* Staeger. Kröj. Tidsskr. 2:578, 61
 1850 *Chironomus* Zett. Dipt. Scand. 9:3573, 99
 1864 *Chironomus* Schiner. Fauna Austr. 2:612
 1874 *Camptocladius* V. d. Wulp. Tijd. v. Ent. 17:133
 1877 *Camptocladius* V. d. Wulp. Dipt. Neerl. p.276

Velvet black. Antennae, legs and halteres black, plume of the antennae of the male blackish, with a whitish shimmer near the tip. Fore metatarsus about one third shorter than its tibia. Wings whitish, the anterior veins pale brown, the others uncolored, without a short black longitudinal dash at the root of the wing, R_{4+5} gradually bent toward the costa and joining it not far from the end; the posterior branch of the cubitus somewhat less bent than in *C. byssinus*; length 2.25 mm. Fork of the cubitus noticeably distad of the crossvein. V. d. Wulp, loc. cit. Greenland; Staeger, loc. cit.; Michigan; New Jersey.

5. *Camptocladius pumilio* Holmgren

- 1869 *Chironomus* Holmg., K. Svensk. Vet. Akad. Handl. 8:5, 41
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.276, 57
 1902 *Camptocladius* Kertész. Cat'l. Dipt. p.1:215

Male. Thorax black, lightly cinereous, subshining, posteriorly with two cinereous, strongly approximated stripes, with yellow pile arranged in two rows. Abdomen black or fuscous black, the base sometimes paler, shining, and with yellow pile. The antennae a little longer than the thorax (not shorter as Holmgren has it). The palpi are black; the legs are more or less brown. The halteres are fuscous black, with the peduncle sometimes sordidly white. The wings are whitish hyaline, the anal

lobes moderately produced, rounded, obtuse angled; the veins toward the costal border are brown, the others thin and pale, both branches of the radius curved; the costa does not extend beyond the tip of the vein R_{4+5} , the media runs into the margin of the wing a little beyond the tip, cubitus forks far distad of the crossvein, its anterior branch ends in the posterior margin of the wing a little proximad of the end of R_{4+5} , the posterior branch is suddenly deflected. The middle and hind legs are sparsely pilose, the fore pair is pubescent; the metatarsus of the fore legs is but little more than one half as long as its tibia.

Female. The antennae shorter than the thorax, the wings shorter and wider, the veins a little more distinct, the media more curved, and the abdomen more robust; everything else as with the male. Length, male and female, 1.75 to 2.25 mm. Greenland, Lundbeck, loc. cit.

6. *Camptocladius byssinus* Schrank

- 1803 *Tipula* Schrank. Fauna Boica. 3:76, 2330
 1818 *Chironomus* Meigen. Syst. Besch. 1:46, 58
 1845 *Chironomus* Staeger. Kröjer, Naturh. Tids. n. s. 1:352, 7
 1850 *Chironomus* Zett. Dipt. Scand. 9:3572, 98
 1864 *Chironomus* Schiner. Fauna Austr. 2:612
 1874 *Camptocladius* V. d. Wulp. Tijdschr. v. Ent. 17:133
 1877 *Camptocladius* V. d. Wulp. Dipt. Neerl. p.276
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.20.
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.273, 53

Velvet black; antennae brownish, plume of the male antenna whitish. Legs blackish brown or pitchy, the hind legs hairy, the fore metatarsus about one half as long as its tibia, the remaining joints in decreasing lengths. Halteres black. Wings milk white, with almost colorless veins excepting at the root of the wing, where there is a short black dash (the basal portion of R); R_{4+5} short, bent toward the costa, which it enters far from its extremity (pl.30, fig.3); the cell R_{2+3} hence quite wide even near its apical end; posterior branch of the cubitus sinuous; fork of the cubitus noticeably distad of the crossvein. Length 1.75 to 2.25 mm. V. d. Wulp, loc. cit. New Jersey. (Johnson, 1899); Greenland (Staeger and Lundbeck); Ithaca N. Y., Michigan, Washington State, Alaska.

7. *Camptocladius minimus* Meigen

- 1818 *Chironomus* Meig. Syst. Besch. 1:47, 61
 1850 *Chironomus* Zett. Dipt. Scand. 9:3573, 100
 1864 *Chironomus* Schiner. Fauna Austr. 2:612
 1874 *Camptocladius* V. d. Wulp. Tijd. v. Ent. 17:133
 1877 *Camptocladius* V. d. Wulp. Dipt. Neerl. p.277

Black, slightly shining. Antennae black, the plumes of the male dark brown. Legs blackish or pitchy or even yellowish brown; the fore metatarsus one third shorter than its tibia. Halteres black. Wings with a grayish tint; the anterior veins pale brown, the others uncolored; no black dash at root of wing; R_{4+5} bent upwards toward the costa and for a short distance appears to coalesce so that at a casual glance it appears thickened at the end; posterior branch of cubitus not so strongly bent as in *byssinus*; fork of the cubitus noticeably distad of the crossvein, pl.30, fig.4. Length 1.25 to 1.75 mm. Ithaca N. Y.; Idaho. Larva found in dung (Howard, 1901).

8. *Camptocladius parvus* Lundbeck

1898 *Chironomus* Lundb. Vidensk. Meddel. p.275, 55

1902 *Camptocladius* Kertész. Cat'l. Dipt. 1:215

Female. Thorax black, somewhat shining, with two sometimes indistinct cinereous stripes, or with three black stripes, the middle one posteriorly, the lateral ones anteriorly, abbreviated. The scutellum is brown, the abdomen is black or fuscous, slightly yellow pilose. The antennae and palpi are dark. The legs are brown, more or less pale. The halteres are dark, the peduncle and the base of the knob sordidly white. The wings are hyaline, in certain lights clear white, pruinose or milky, the posterior margin long ciliated, the anal lobe but little produced, rounded; the veins pale and thin; the radius is somewhat brownish, its anterior branch is short, and runs into the costa near the middle of the wing; its posterior branch is nearly straight, the media curves towards the tip and runs into it, the cubitus forks somewhat distad of the crossvein, its posterior branch is suddenly deflected, the anterior branch and the main trunk are about of equal length. The middle and hind legs are distinctly pilose, the anterior metatarsus is one half the length of its tibia. Length 1.5 mm. Greenland. Lundbeck, loc. cit.

9. *Camptocladius velutinus* Lundbeck

1898 *Chironomus* Lundb. Vidensk. Meddel. p.274, 54

1902 *Camptocladius* Kertész. Cat'l. Dipt. 1:215

This species resembles *C. byssinus* and *C. minimus*, but differs from the former in having smoky wings and in being smaller; from the latter in having shorter metatarsi, and from each in its wing venation.

Female. Thorax black, velvety, with two indistinct longitudinal stripes, anteriorly confluent; the abdomen black, velvety, sparsely yellow, pilose; the scutellum brown. Antennae and palpi dark.

The legs black or blackish brown. The halteres are dark, peduncle and base of knob sometimes sordidly white. The wings gray or smoky, the anal lobe moderately produced into an obtuse angle; the veins are thin and pale, the radius is dark, R_{4+5} almost straight, the costa extends a little beyond the tip, the media runs into the tip of the wing, the fork of the cubitus is about opposite the crossvein, its posterior branch suddenly deflected. The middle and hind legs are very pilose, the fore metatarsus is about one half the length of its tibia. Length, 1.5 mm. Greenland. Lundbeck, loc. cit.

10. *Camptocladius extremus* Holmgren

1869 *Chironomus* Holmgr. K. Svensk. Vet. Akad. Handl. 8:5, 40

1898 *Chironomus* Lundb. Vidensk. Meddel. p.276, 56

1902 *Camptocladius* Kertész. Cat'l. Dipt. 1:214

1865 *Chironomus aterrimus* Bohem. Öfv. K. Vet. Akad. Förh. p.575, 24, part

Male. Black, silky. Antennae fuscous black. Wings whitish hyaline, toward the costa subinfuscated; the halteres fuscous black, the legs the same color.

Female. Black, cinereous pruinose. The antennae pilose, the legs fuscous black. Wings somewhat cinereous toward the costa, subinfuscated. Halteres dark.

Male and female. Wings moderately wide, bare, the margins ciliated, the anterior veins stronger and darker than the others, which are pale and thin; there are two distinct spurious costal veins (folds?); a short subcostal vein is usually present. The fork of the cubitus is a little distad of the crossvein, Cu_2 much curved; R_{4+5} ends very near the tip of the wing. The legs of the male have longer pile than those of the female; in both sexes the tibiae and the tarsi of the fore and middle legs nearly bare. The fore tibiae rather long, straight, thickened at the base; fore metatarsus one half or at least one third shorter than its tibia. Length about 1.5 mm. Greenland. Holmgren, loc. cit.

This species is closely related to *C. byssinus*, but it differs in that the base of the fork of the cubitus lies under the crossvein or but little distad of it. Lundbeck, loc. cit.

Genus 41. *Orthocladius* Van der Wulp

Tijdschr. v. Entomol. XVI (LXX) and XVII, 132

The larvae and pupae greatly resemble those of *Cricotopus*, and I have been unable to find a single character which will separate all the species of the one genus from those of the other.

Imago. Resembles *Cricotopus* and *Camptocladius*. The fore metatarsus is shorter than the tibia; the legs are not black and white annulate, but nearly uniform in color, either dark or light, in the latter case at most with only dark articulations. Wings bare, R_1 enters the costa beyond the mid length of the wing; R_{4+5} straight or only slightly bent, reaching the end of the costa; crossvein at or even before the mid-length of the wing; the forking of the cubitus usually noticeably distad of the crossvein; the posterior branch straight or gently curved. Genitalia of the type shown on pl.33, fig.1, thus resembling *Cricotopus* (fig.2). The species usually small, though occasionally of moderate size. In other respects like *Chironomus*. It will be noted that it does not differ structurally from *Cricotopus*, differing only in color characters.

KEY TO SPECIES OF ORTHOCLADIUS

Larvae

- a* Mandible slender with sharp apex; antennae slender; margin of labium irregular, pl.24, fig.12.....5. *flavus* n.sp.
- aa* Mandible rather stout; margin of labium with regular teeth
 - b* First laterals of the labium notched on the outer margin; mandible with lateral surface wrinkled.....15. *fugax* n.sp.
 - bb* First laterals with rounded margins
 - c* Labium on the lower surface with two converging folds, pl.25, fig.14
7. *sordidellus*
 - cc* Labium without these folds, pl.24, fig.21.....8. *nivoriundus*

Pupae

- a* Posterior margin of each abdominal segment with a row of long stout setae, pl.24, figs. 15 and 16.....5. *flavus* n.sp.
- aa* The segments without these setae
 - b* Dorsal surface of each segment nearly uniformly covered with minute spines and four pairs of setae; respiratory organ with enlarged apical end, pl.24, figs. 22, 23, 24.....8. *nivoriundus*
 - bb* Dorsal surface with several transverse patches of minute spines
 - c* The patch covering the center of the disk of each segment largest, pl.25, figs. 7 and 11.....15. *fugax* n.sp.
 - cc* The middle band consists of two irregular rows of short stout spines
7. *sordidellus*

Imagines

- a* Yellowish species. (The females, and the species with brown abdomens, should be sought for in the next section also.)
- b* Large species 6 mm. in length; yellow; thorax with three dark yellow or brown stripes; abdomen with two brown spots on each segment; male1. *par*

- bb* Smaller species with pale or yellowish brown abdomen; if not, then abdomen is without distinct spots
- c* Thoracic stripes black
- d* Thorax yellow; three vittae on mesonotum, spot below each wing, the pectus and metanotum black, mesonotum highly polished, scutellum brownish yellow; legs brown, fore metatarsus three fourths as long as its tibia; length 2.5 mm.; abdomen pale brown; male. (District of Columbia)2. *politus*
- dd* Abdomen fuscous black; legs brownish; length 3 mm.; female. (See *sordidellus* also)3. *frigidus*
- cc* Thoracic stripes brown or reddish
- d* Abdomen of male with spots on sides of last two segments. Eastern species4. *oceanicus*
- dd* Abdomen not spotted
- e* Species having black tibiae and tarsi; length 3.5 to 4 mm.5. *flavus* n. sp.
- cc* Tibiae and tarsi yellow or pale fuscous; smaller species
- f* Minute yellow species having the crossvein of the wing at the basal third; length .75 to 1 mm.6. *sordens* n. sp.
- ff* Larger species with the crossvein beyond the basal third of the wing; length 2 to 3 mm.7. *sordidellus*
- aa* Blackish or fuscous species
- b* Wings with an hourglass-shaped spot20. *clepsydrus*
- bb* Wings not so marked; halteres dark
- c* Wings slightly smoky in both sexes; for metatarsus over .6 as long as its tibia
- d* Fore legs of male long haired; thorax of female anteriorly with yellow spots19. *barbicornis*
- dd* Fore legs of male nearly bare; thorax of female blackish8. *nivorundus*
- cc* Wings of the male at least, milk white; fore metatarsus about one half as long as its tibia; larva terrestrial...9. *stercorarius*
- bbb* Wings not so marked; halteres white or pale
- c* Legs pale; thorax with three stripes, sometimes indistinct
- d* The fore metatarsus about one half as long as its tibia; hind tibiae and tarsi scarcely pubescent; length 1 to 1.3 mm.10. *atomarius*
- dd* Fore metatarsus more than one half as long as its tibia
- c* Thorax yellow with three brown stripes; scutellum yellow, metathorax black; abdomen brownish, or sordidly yellow; legs pale yellow, tipped with black; wings white; length 2 to 4 mm.7. *sordidellus*
- cc* Usually smaller species (2.5 mm. or less) and otherwise not as above
- f* Fork of the cubitus under the crossvein
- g* Fore metatarsus a little shorter than its tibia; thorax, including scutellum and pleura, yellow, the three stripes, pectus and metanotum brown; abdomen fuscous, base and venter yellowish; length 2 to 2.25 mm. (Greenland)11. *difficilis*

- gg* Fore metatarsus 0.6 as long as its tibia; female with a peculiar egg guide, pl.33, fig.7, . . . 12. *absurdus* n. sp.
- ff* Fork of cubitus distad of crossvein
- g* R_{4+5} enters the wing margin far proximad of tip of Cu_1 ; length 1.25 to 2 mm. (Greenland) . . . 13. *claripennis*
- gg* R_{4+5} enters wing margin distad of Cu_1
- h* Small blackish species 1 to 1.5 mm. long; fore metatarsus a little shorter than its tibia. 14. *minutus*
- hh* Species 2 to 2.5 mm. long; greenish black; fore metatarsus a little over one half as long as its tibia
15. *fugax* n. sp.
- cc* Legs fuscous or black; thorax of male usually not striped; antennae black
- d* Small black species 1 to 1.5 mm. in length; fore metatarsus a little shorter than its tibia. 14. *minutus*
- dd* Larger species 2.5 to 3 mm. in length
- e* Fourth tarsal joint obcordate, shorter than the fifth. (For description see genus *Thalassomyia*) . . . *platypus*
- cc* Fourth tarsal joint linear
- f* Fore metatarsus at least three fourths as long as its tibia
- g* Anterior tarsi of the male densely hairy; wings white; veins fuscous at base; abdomen subshining black; length 3 mm. 16. *pubitarsis*
- gg* Fore tarsi of the male nearly bare; last three abdominal segments with pale margins; thorax of the female striped. (Compare also *sordidellus*)
3. *frigidus*
- ff* Fore metatarsus not more than two thirds as long as its tibia
- g* Wings whitish hyaline, a little darker in the female; abdomen fuscous, with fuscous hairs
17. *obumbratus* n. sp.
- gg* Wings cinereous; abdomen velvet black with the margins of the segments shining black; fork of the cubitus under or but very slightly beyond the crossvein. . . . 18. *basalis*

NOTE—Consult also the auxiliary key of Walker's species on p.198

1. *Orthocladius* par Coquillett

1901 *Orthocladius* Coq. Proc. U. S. Nat. Mus. 23:608

Male. Yellow, the antennae except the basal joint, apices of front femora, of their tibiae and of their first two tarsal joints, the whole of the remaining joints, also the last two on the other tarsi, brown; a pair of rather large black spots on abdominal segments two to eleven (sic.); mesonotum marked with three darker yellow vittae, hairs of antennae bright yellow, becoming brownish at their apices; front tarsi destitute of long hairs, the fourth joint more than one third as long as the first; wings bare, whitish hyaline, the portion in front of R_1 and R_{4+5} dark gray, the veins brownish; length 6 mm. Riverton, N. J. Coquillett, loc. cit.

2. *Orthocladius politus* Coquillett1902 *Orthocladius* Coq. Proc. U. S. Nat. Mus. 25:93

Male. Head yellow, antennae brown, its hairs yellowish brown; thorax yellow, the three vittae on mesonotum, spot below each wing, the breast and metanotum black, mesonotum highly polished, scutellum brownish yellow, polished, its base opaque blackish; abdomen yellowish brown, becoming darker toward the apex; legs brown, trochanters and extreme bases of femora yellow, middle and hind tibiae and bases of their tarsi dull yellowish, legs only pubescent, fourth tarsal joint slender, as long as the fifth, first joint of front tarsi three fourths as long as the tibiae; wings hyaline, small crossvein not darker than the adjacent veins, R_{4+5} almost straight; halteres yellow; length, 2.5 mm. Washington D. C. Coquillett, loc. cit.; New Jersey, (Johnson).

3. *Orthocladius frigidus* Zetterstedt1838 *Chironomus* Zett. Ins. Lappon. p.812, 141850 *Chironomus* Zett. Dipt. Scand. 9:3516, 331872 *Chironomus* Holmgr. Öfv. K. Vet. Akad. Förh. 29:1051878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.201898 *Chironomus* Lundb. Vidensk. Meddel. p.279, 611902 *Orthocladius* Kertész. Cat'l. Dipt. 1:218

Male and female. Black, subopaque, dorsum of the thorax in the male with a testaceous margin; in the female testaceous with three separated black stripes; the wings cinereous hyaline; the antennae and the legs fuscous. Length 3 mm.

Black, somewhat opaque, and but slightly pubescent. The antennal hairs of the male fuscous black. The thorax pale fuscous underneath, the dorsum with three stripes; these in the male are dilated and confluent, in the female separated, black in color, as is also the metathorax; scutellum yellow. Abdomen of the male narrow, of the female more robust; in both sexes it is black, somewhat hairy; the last three segments with pale apical margins. Wings subhyaline, spotless, the crossvein and the radius subfuscous. Halteres white. The legs wholly fuscous black, tibiae and tarsi slightly paler; somewhat pubescent; fore metatarsus about one fourth shorter than its tibia; fore tarsi bare. Greenland (Staeger, Holmgren and Lundbeck).

According to Lundbeck (1898, p.280) the species which Staeger (1845, p.354) mentions is not *O. frigidus* but *O. pubitarsis* Zett.

4. *Orthocladius* (?) *oceanicus* Packard

1869 *Chironomus* Packard. Proc. and Commun. Essex Inst. 6:42

1878 *Chironomus* Ost. Sack. Cat'l. Dipt. p.21

Larva. It is pale whitish in color, the thoracic rings being tinged on their harder parts with green. It is .22 to .25 of an inch in length. The labium is somewhat triangular and multidentate on the anterior side. This larvae differs from fresh-water larvae of the same genus from Lake Champlain in not having the three-jointed filamentous appendages inserted just above the anal legs. The pair of anal legs is well-developed, and terminates in a single crown of hooks, which can be retracted entirely out of sight. In the fore legs the hooks are much more numerous and arranged in longitudinal rows, about twenty-five in number; those on the upper side of the tip being much the largest, those at the base being minute (pl.34, figs. 17, 18, 19).

Pupa. There are no thoracic filaments, nor is the abdomen terminated with hairs, but the genital armor is well-developed.

Imago, male. The antennae of the male are about as long as the thorax, arising from a knob-like basal joint; the joints are of even length, and from each one arises long delicate hairs, which in our specimens were somewhat appressed to the antennae. But we think it was due to the immaturity of the specimens, and that the hairs stand out as usual in the genus. The lingua is short; palpi well-developed, incurved; eyes large globose, prominent, black. The body is throughout pale testaceous; on the anterior half of the thorax is an oblong light brown spot and an irregular oval spot on each side of the posterior half of the thorax, extending to a point opposite the insertion of the wing. On the under side of the mesothorax is a broad, flattened, corneous area, the fore legs being widely separated from the two posterior pairs. The sides of the thorax are pale with a few dusky spots. The legs are long and very slender, the middle and hind tibiae and tarsi dusky. The wings are white, reaching when folded to the end of the third segment from the end of the body. The abdomen is dusky brown, paler at the tip, with a dusky spot on each side of the last two segments; on the under side is a faint greenish tinge. The tip is flattened, the anal forceps are large with the tip bent in, forming a V, and meeting on the median line of the body. Compared with what is evidently a true *Chironomus* from Labrador, and other species living in Massachusetts, the thorax of the present species is longer and less globular, the mesosternum presents a longer area, and the antennae are longer and slenderer. The wings are unspotted; there is no transverse costal veinlet at the base of the wing; the costal vein terminates beyond

the middle of the wing, and the first subcostal veinlet terminates on the outer third of the wing, differing in these characteristics from the more typical *Chironomi*. The abdominal hairs are also shorter.

Female. The female has short 7-jointed antennae, of which the terminal joint is nearly twice as long as the one next to it; they are slightly hairy. The female of our species differs from the other true *Chironomi* in the shorter and stouter antennae and shorter and smaller palpi. The eyes are much as usual, as is the size of the head in proportion to the thorax. Our female specimen was too incomplete for further description.

The larvae were dredged from Salem harbor. Packard, loc. cit.

The terminology of the wing veins given above is as was given by the author, and therefore does not conform to that used in the other descriptions.

5. *Orthocladius flavus* n. sp.

Larva. (Pl.24, figs.11 to 17) Yellowish; head yellowish brown; length about 10 mm. Head short, extreme apical margin of labium and posterior margin of head black. Antennae yellow, moderately long, about one fourth or one third the length of the head, slender; apical joints very short and slender (fig.12a). Labrum flap-like, with rounded margin and having a pair of widely separated short yellow setae, the lateral margin fringed. Its under surface (and epipharynx?) differs considerably from the usual type, consisting here of slender caudad projecting lobes and the usual pair of lateral arms with black apices (fig.14). The mandibles (fig.12 md) are yellow, slender, pointed, and only the tip and the teeth black. The inner membranous part has several setae on its cephalic margin. The maxillae (fig.12 mx) are yellow, broad, flattened, each with a short palpus and a number of papillae. At the basal articulation are two branched setae. The hypopharynx (fig.11) is horseshoe-shaped, with papillae on its free margin. The labium (fig.12 l) has several moderately long lateral teeth, several blunt short teeth nearer the central line, and two small sharp ones at the apex. The anterior feet are very short, the yellowish brown claws simple and quite numerous. The body is yellow, moderately stout, with a very few scattered, small, slender setae. Posterior feet are rather short, about as long as the last body segment, claws nearly black, each with two teeth; the outer one slender, curved, the inner one straight, stout, and about one third as long as the outer one, each foot with 16 to 20 claws. The four anal blood gills are as long as the feet, blunt, and white in color. The two dorsal papillae are

dark brown on the under surface and pale above, but little longer than wide, each with 7 or 8 long brown setae at apex.

The larva constructs an oval case (fig.17), about 16 mm. in length, the thick outer coat of which is gelatinous, transparent; the inner tube in which the larva lives is dark brownish green, owing to the material (*Spirogyra*, etc.) of which it is constructed. When it is disturbed the larva escapes from a hole at the end of the tube. Normally it keeps up a water circulation through the tube by the undulating motion of its body.

Pupa. The pupa resembles very much that of *Thalassomyia fusca*. It is dusky yellowish brown in color, the ventral surface somewhat lighter. The respiratory organs are slender, about one fifth as long as the thorax, the surface covered with distad projecting scales (fig.13). Upon the dorsal surface of the thorax are several pairs of short black setae. The dorsal surface of all abdominal segments is finely sprinkled with very minute, short, dark setae; the armature of the posterior margin of the seventh segment is shown in fig.15; the margins of the other segments resemble this arrangement, but the spines become gradually shorter cephalad so that on the first segment the spines are replaced by short tubercles. The anal fin is broad and somewhat rounded at the apex, with two pale slender setae near the apex, and with a margin of moderately long, pale, matted hairs (fig.16).

Imago, female. Yellow; antennae, palpi, metathorax, and legs excepting femora, black. Length 3.5 to 4 mm.

Head and proboscis yellow, the latter with black tip; occiput slightly infuscated, palpi deep brown, the basal joint and basal one half of second joint of antenna yellow, the remaining joints deep brown. Thorax deep yellow, with three deep brown lines, the middle one divided by a yellow hair line, a dark brown spot in front of base of wing; pleura and scutellum yellow, pectus and metanotum black. Upon the yellow field of the dorsum and upon the scutellum are several irregular rows of short black hairs. Abdomen pale yellowish brown, disk of each segment a little darker, the posterior margin dorsally with a narrow, ventrally with a wider, yellow fascia. Hairs black. Genitalia yellow and inconspicuous. Fore pair of coxae yellow, middle and hind pair fuscous; all legs black; flexor surface of all femora, except extreme tip, yellow. The extreme basal portion of extensor surface of all femora also yellow. Legs microscopically hairy, fore tibiae with one, and middle and hind tibiae each with two small black spurs; pulvilli and empodium present; fore metatarsus about 0.6 as long as its tibia. The hyaline wings are broad and long, extending beyond the tip of the abdomen, the veins distinct, the anterior

ones yellow, the posterior ones hyaline. Venation as shown in pl.30, fig.6. Halteres cream white; peduncle slightly darker. One specimen bred from larva taken from pond water July 2, Ithaca N. Y.

6. *Orthocladius sordens* n. sp.

(Pl.30, fig.5)

Female. Yellow; face, proboscis, palpi and antennae yellowish, the palpi and the antennae, except the basal joints, somewhat infuscated. Vertex brownish yellow. Thorax yellow with its three dorsal stripes, metathorax and the sternum reddish. Abdomen yellow, sometimes somewhat infuscated. Fore metatarsus about one third shorter than its tibia; legs yellow, tibiae and tarsi somewhat infuscated. Wings hyaline, anterior veins yellow, posterior one colorless; cubitus forks distad of the crossvein; crossvein at basal third of wing; venation as figured. Halteres yellow. Length $\frac{3}{4}$ to 1 mm. Several specimens, Ithaca N. Y. Two mutilated specimens from South Dakota may also belong here.

7. *Orthocladius sordidellus* Zetterstedt

- 1838 *Chironomus* Zett. Ins. Lappon. p.814, 26
 1850 *Chironomus* Zett. Dipt. Scand. 9:3521, 38
 1864 *Chironomus* Schiner. Fauna Austr. 2:609
 1874 *Orthocladius* V. d. Wulp. Tijds. v. Ent. 17:133
 1877 *Orthocladius* V. d. Wulp. Dipt. Neerl. p.280, 6
 1839 *Chironomus variabilis* Staeger. Kröjer: Naturh. Tids. 2:571, 44
 1850 *Chironomus* Zett. Dipt. Scand. 9:3519, 36
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. p.21
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.280, 63
 1839 *Chironomus varians* Staeger. Kröjer's Tids. 2:573, 47
 1850 *Chironomus* Zett. Dipt. Scand. 9:3546, 71

Larva. (Pl.25, figs. 12 to 15.) Yellowish green; head short, brown, with a number of delicate dorsal setae. Each eye consists of two nearly contiguous spots. Antennae (fig.13) short, about three fifths the length of the mandibles, brown in color with apex of each joint paler. Labrum blunt at apex, with a few short marginal papillae and apical setae (fig.12); epipharynx with the usual lateral arms, but the curved setae are very much reduced and modified. Mandibles stout, apical one half, sometimes wholly, black or dark brown, with a long, slender, lateral seta (fig.14 md). The maxilla (fig.14 mx) has a short palpus, some papillae, and a mesad-projecting tuft of pointed filaments; upon its ventral surface a pair of setae, and another larger pair upon the anterior margin of the ventral head sclerite below the base of the maxilla. The hypopharynx has three tufts of papillae upon its margin, one

median and the others lateral. The labium has rounded teeth, the first laterals as long as but not as wide as the middle one; the remaining laterals are more pointed. Viewed from the ventral surface two oblique folds or thickenings in the chitin, one on each side nearly parallel to the toothed margin, may be seen. The claws of the anterior prolegs are coarse and pectinate. The anal prolegs and appendages resemble those shown on pl.25, fig.6. The larvae were taken from a brook near Ithaca N. Y.

Pupa. Yellowish; length 3 to 3.5 mm. Respiratory organs very small. The marking on the dorsum of the abdominal segments (a side view of one is shown in fig.15) consists of four transverse rows on each of segments 2, 3, 4, and 5; and two rows on 1, 6, 7, and 8. The first transverse row on a segment consists of about two or three rows of extremely minute spines; the second an interrupted double row of short but stout spines; the third an irregular triple row near the posterior margin; all these pointing caudad; and finally in the fold of the incisure there is an irregular triple row of much smaller ones pointing cephalad. The second and last rows are wanting on segments 1, 6, 7, and 8. The caudal appendages are like those shown on pl.24, fig.3, for a species of *Cricotopus*. Larva and pupa have recently been described by Taylor (1903).

Imago. (Pl.30, fig.7) This species resembles *Chironomus viridis*, but differs in the generic characters. Dorsum of thorax with three dark brown stripes; the metathorax and sternum black; scutellum yellow; the abdomen brownish, the forceps small, the arms rather thick. Antennae, including the basal joints, brown; the hairs pale brownish; palpi brownish red. Legs pale yellow; the extreme tips of the tibiae black; the tarsi dusky; fore metatarsus one third or one fourth shorter than its tibia. Wings whitish. Halteres yellow. Length 2.75 to 4 mm. Greenland, New York, Washington, Texas, Illinois.

Zetterstedt's description of *variabilis*, which is considered a synonym of the above, is as follows:

Male. Antennae with dark hairs. Head blackish; palpi fuscous. Thorax subopaque, yellow or testaceous, with three black or brown stripes, often distinct, sometimes very wide subconfluent, covering nearly the whole of the dorsum, leaving the humeri pale. Sternum blackish; scutellum more or less yellow; metathorax black. Abdomen narrow, hairy, black, the venter yellowish or testaceous, after death often blackish. The caudal end black, the appendages leaf-like or narrow ovate. Wings white or cinereous hyaline, spotless; halteres pale yellow. Legs nearly bare, brown, fuscous or testaceous, the femur toward the tip often darker, the fore coxae yellow, the tarsi often fuscous, especially the fore pair.

The fore metatarsus about one fourth shorter than its tibia, and about one third longer than the next tarsal joint; tarsi bare. Length 2.5 to 3 mm.

Female. Differs from the male thus: The base of the antenna is often yellow, the thoracic stripes are always distinct, the yellow of the dorsum is usually conspicuous; the abdomen is stouter, less hairy, venter very often conspicuously yellow; the wings cinereous, the wing veins near the costal margin subtestaceous, and lastly, the body is stouter. Length 2 to 2.7 mm.

8. *Orthocladus nivoriundus* Fitch

1846 *Chironomus* Fitch. Winter insects of Eastern New York. p.274

1878 *Chironomus* Osten Sacken. Catl. Dipt. N. A. p.21

1898 *Orthocladus* Johnson. Catl. N. J. Dipt. p.627

I formerly erroneously regarded this species as a synonym of *Diamesa walthii*.

Larva. (Pl.24, figs.18 to 24). The larvae were collected from pond water on March 28 and the flies emerged the following week. The larva is a pale green creature, somewhat infuscated on the dorsum. Length 6 mm. Head deep brown, short; antennae (fig.19) short, a little less than three fourths as long as the mandible, first joint three fifths of total length, apical appendage of the first joint as long as the second and third joints taken together. Each eye consists of a pair of spots separated by a fine line. Labrum with three pairs of moderate size and about three pairs of small setae on the lower surface; epipharynx with the usual arms and curved pectinate setae. The mandible is stout, with black toothed apex; the maxilla (fig.21 mx) has a small palpus, several blunt setae, some fine hairs and a bunch of mesad projecting, delicate, pointed filaments. The free margin of the labium is provided with black teeth, the middle one broad, with a rounded margin (fig.21 l). The dark thoracic prolegs have the usual slender hairs, but these are apparently either bifid or pectinate. The anal prolegs have sharp bilobed claws. The papillae of the anal hair tufts are short and dark brown in color. Caudad of these is a pair of prominent setae and on the ventral surface cephalad of the anal prolegs is another pair. The anal prolegs are of the usual form. The anal blood gills are present.

Pupa. Black or deep fuscous; abdomen paler. Length about 4 mm. The thoracic spiracles are slender, tubular, with a roughened surface (fig.23); length perhaps a little less than an abdominal segment. The dorsum of each segment, excepting the seventh and eighth, is nearly wholly covered with very short, microscopic spines, besides about four pairs of longer black setae as shown in fig. 22. Sometimes those near the caudal margin

are wanting, or replaced by others nearer the anterior pair. The lateral fins of the seventh and eighth segments have four or five pale, slender filaments; the caudal appendage is fringed with slender hairs, and there are three stout setae at each angle of the apex.

Imago, female. (Pl. 30, fig. 8) Grayish black. Length 2.5 to 3 mm. Wholly grayish or brownish black, including head with all its parts, thorax and abdomen. Legs pale brown; fore legs nearly wholly bare, middle and hind ones sparsely haired. Fore metatarsus about 0.6 as long as its tibia. Wings slightly smoky hyaline, anterior veins brown, posterior veins hyaline. Venation as shown in figure. Halteres dull black.

Male. Wholly black, very slightly shining. Thorax with a suggestion of three black dorsal stripes; the other parts dull. Abdomen with dark brown hairs. Antennal hairs, black. Legs, dark brown, or almost black, fore tarsi nearly bare. Anal angle of wing prominent; anterior veins brown, wings slightly cinereous. Genitalia black. Length 3.5 mm. In other respects like the female.

This species differs from *stercorarius* in having smoky wings in both sexes, abdomen of female darker, and in having an aquatic larva. Ithaca N. Y. The following is a copy of Fitch's description.

Black; poisers obscure brown; wings pellucid-cinereous, their anterior nervures blackish. Length about .15 inch to the tip of the abdomen in the male—females one third shorter.

This species is black throughout, and clothed with fine black hairs. The thorax has three slightly elevated longitudinal ridges immediately forward of the scutellum. The wings, when the insect is at rest, are held against the sides of the abdomen, often vertically in the males, but more commonly in the females with their inner margins in contact, thus forming a steep roof covering the back. They are diaphanous, of a cinereous tinge, and feebly iridescent. Their inner margins toward their bases are slightly arcuated. The submarginal or postcostal nervures—those which bound the closed basillary cell, and which proceed from this cell to the margin—are particularly obvious, being of a blackish color, excepting the nerve which proceeds from the inner angle of this cell to the apex of the wing, which, with the nervures inside of it, scarcely differ in color from the surface which they ramify. The poisers are obscure-brownish, truncated at their apices, the capitulum being in the form of a reversed triangle. The abdomen in the female is shorter than the wings, somewhat compressed, approaching to an ovate form when viewed laterally, with the venter

often of a dull brownish tinge; in the males it projects beyond the tips of the wings, is slender, cylindrical, or very slightly tapered towards the tip, with some of the terminal segments separated by a strong contraction.

This is a very common species, appearing upon the snow in the winter season, and upon fences, windows, etc., in the fore part of spring, the males and females being about equally numerous. The beautiful plumose antennae of the former distinguish them at a glance from all other insects abroad at this season. At times they may be met with in immense swarms.

Some specimens of larvae and adults from Gallinas river, Las Vegas N. M. (altitude 6400 feet), do not appear to differ excepting in being a little larger; the genitalia of the male resembles that of *Diamesa waltlii*. It is possible that on examination of more material the New Mexican form may prove to be a distinct species.

9. *Orthocladus stercorarius* Degeer

- 1776 *Tipula* Deg. Mem. pour serv. a l'hist. d. Ins. 6:388, 22
- 1818 *Chironomus* Meig. Syst. Besch. 1:46, 57
- 1850 *Chironomus* Zett. Dipt. Scand. 9:3571, 97
- 1864 *Chironomus* Schiner. Fauna Austr. 2:612
- 1872 *Chironomus* Holmgr. Öfv. K. Vet. Akad. Förh. p.105
- 1874 *Orthocladus* V. d. Wulp. Tijds. v. Ent. 17:133
- 1877 *Orthocladus* V. d. Wulp. Dipt. Neerl. p.279, 2
- 1878 *Chironomus* Osten Sacken. Catl. Dipt. N. A. p.21
- 1898 *Chironomus* Lundb. Vidensk. Meddel. p.277, 58
- 1804 *Chironomus chiopterus* Meig. Klass. 1:17, 18

Wholly dull black; the antennae blackish brown, the hairs scarcely lighter. Forceps of the male black. Legs blackish brown, pitchy, or occasionally still paler; the fore legs bare; the fore metatarsus only one half as long as its tibia. Wings milky white. The halteres black or brown. The female has somewhat darker wing and lighter abdomen. Length 1.5 to 2.75 mm. Greenland. Holmgren and Lundbeck.

10. *Orthocladus atomarius* Zetterstedt

- 1850 *Chironomus* Zett. Dipt. Scand. 9:3522, 40
- 1864 *Chironomus* Schiner. Fauna Austr. 2:609
- 1884 *Orthocladus* Mik. Wien. Ent. Zeitg. 3:202
- 1898 *Chironomus* Lundb. Vidensk. Meddel. p.283, 68

Resembles *O. sordidellus*, but is much smaller and the structure of the tarsi is different. Thorax brown, subshining, the dorsum usually yellowish, light brown or testaceous, with three nearly confluent dark stripes; metathorax black. Abdomen

brown, venter lighter, genitalia small. Antennae and its hairs brown. Legs yellow or sordidly white, nearly bare; fore metatarsus only one half as long as its tibia; bare. Wings whitish, immaculate. Halteres white. Length 1 to 1.3 mm. Schiner, loc. cit. Greenland, Lundbeck. Ithaca, N. Y.

11. *Orthocladius difficilis* Lundbeck

1898 *Chironomus* Lundb. Vidensk. Meddel. p.282, 67

1902 *Orthocladius* Kertész. Cat'l. Dipt. 1:217

Male. Thorax yellow or reddish yellow, with three dark brown stripes, the median posteriorly, the lateral ones anteriorly abbreviated. Scutellum yellow, the metathorax brown, the pleura yellow, the sternum brown; abdomen fuscous black, yellow pilose, the base and the venter yellow. The antennae brown; the palpi sordidly yellow. Legs yellow; the tip of each of the tibiae blackish brown. Halteres yellow; wings almost hyaline, the anal lobe produced, right angled, rounded at the apex; the veins pale and thin, a little stronger and darker at the costal margin. R_{4+5} straight, and enters the margin of the wing a little distad of the Cu_1 ; the costa is not produced beyond the tip of the wing, the media is straight and enters the tip of the wing, the fork of the cubitus lies below the base of R_{4+5} , its upper branch is a little longer than the main trunk, the lower branch is lightly curved at the tip. The middle and hind pairs of legs are hairy or pilose, the fore metatarsus is a little shorter than the tibia.

Female. Is a little smaller than the male, and the base of the abdomen is but little or not at all yellow; in other respects like the male. Length of male and female 2 to 2.25 mm. Greenland, Lundbeck.

12. *Orthocladius absurdus* n. sp. *

(Pl.30, fig.9; pl.31, fig.8; pl.33, fig.7)

Female. Yellowish brown, including the legs. Genitalia with peculiar clasper-like egg guides. Length 3 mm. Head yellowish brown, including proboscis, palpi and antennae, the basal joint of the last yellow; first joint disk-like, the incisure between the second and third not sharply marked, the seventh elongate (pl.31, fig.8). Thorax, including scutellum, pale yellowish brown; the three dorsal stripes, the metanotum, a spot on the pleura and the pectus darker brown. Abdomen yellowish with a greenish tinge, the dorsum of each segment brownish, except on both sides of each incisure narrowly pale yellow. Hairs pale and sparse. Genitalia with the usual lobes of the female, but in addition a pair of slender arms each with six or seven long setae at the extremity (pl.33, fig.7). Legs uniformly yellowish brown;

fore metatarsus about 0.6 as long as its tibia. Wings hyaline, veins yellow, rather distinct, the anterior veins quite stout (pl.30, fig.9). Halteres pale. One specimen, Ithaca N. Y.

At first I considered this specimen the male of a new genus owing to the peculiar clasper-like appendages of the extremity of the abdomen; but the robust form of the abdomen, the form of the genital lobes, and the antennae, lead me to believe that the specimen is a female.

13. *Orthocladius claripennis* Lundbeck

1898 *Chironomus* Lundb. Vidensk. Meddel. p.281, 66

1902 *Orthocladius* Kertész. Catl. Dipt. 1:217

Resembles *O. minutus* Zett., but its smaller size, the position of the fork of the cubitus, and the shortness of R_1 , distinguishes it.

Male. Thorax fuscous black, with three indistinct black stripes (at least in dried specimens); scutellum brown. Abdomen more or less pale fuscous, with yellow pile. The antennae reddish brown; the palpi yellow. Legs slender, yellow, the tibiae blackish brown at the tip. The halteres white; the wings hyaline and the anal lobe moderately produced, obtuse-angled, the veins slender and pale; R_{4+5} is short, and enters the margin of the wing far proximad of the tip of Cu_1 ; the media is almost straight, and runs into the tip of the wing; the fork of the cubitus is a little distad of the base of R_{4+5} , its lower branch is almost straight, only at the tip is it curved. The middle and hind legs are pilose; the fore metatarsus is a little shorter than its tibia.

Female. Is shorter and paler than the male, thorax yellow, with three brown stripes, the middle one posteriorly, the two lateral ones anteriorly abbreviated, and the scutellum is yellow; in other respects like the male. Length, male and female, 1.25 to 2 mm. Greenland. Lundbeck, loc. cit.

14. *Orthocladius minutus* Zetterstedt

1850 *Chironomus* Zett. Dipt. Scand. 9:3522, 39

1864 *Chironomus* Schiner. Fauna Austr. 2:609

1884 *Orthocladius* Mik. Wien. Ent. Zeitg. 3:202

1898 *Chironomus* Lundb. Vidensk. Meddel. p.281, 65

1898 *Orthocladius* var. *placensis* Strobl. Glasnik Zem. Mus. Bosni i Hercegov. 10:613

Black, or blackish brown, somewhat shining, the last abdominal segment wider than the one preceding it; the forceps small. The antennae, including its hairs, brown. Legs yellowish brown.

the femora somewhat darker; the fore tarsi of the male bare or nearly so, fore metatarsus somewhat shorter than the tibia, the hind tibiae and tarsi thickly haired; wings whitish, spotless. Halteres white. The female has a light spot on each humerus, and the posterior legs have fewer hairs. Length 1 to 1.5 mm. Greenland. Lundbeck.

15. *Orthocladus fugax* n. sp.

Larva. In little rolls or tubes of debris upon the flat rock bottom of Cascadilla creek (Ithaca N. Y.) little bluish green larvae with dark brown heads were found. These larvae are rather more robust than those of many Chironomids, the middle body segments being fully as wide as they are long. The total length of a full-grown larva is from 3 to 4 mm. Head dark brown, short, with the suture separating the dorsal from the lateral sclerites quite distinct, the dorsal sclerite being elongate-oval, acute-angled at its caudal margin, with three setae upon each lateral margin, the most posterior of these being cephalad of the middle transverse line; opposite this last seta near the suture but upon the lateral sclerite is another seta a little caudad of this, also near the suture there is still another, and on each side near the ventral surface, directly ventrad of the paired eye spot, there is a pair. The pale brown antennae (pl.25, fig.3a) are short, only about one half as long as the mandibles. The latter is stout, its apical half blackened, and with a stout seta on its side. The labrum (fig.3) has a somewhat blunt apex with a few small setae; the epipharynx has the usual pair of arms the ends of which are not conspicuously darkened. The maxilla (fig.2 mx) has a short palpus and a few papillae and a group of mesad projecting filaments. The labium is brown, has a deep margin of black, the middle tooth is rounded, the first lateral has a more or less distinct notch on its lateral edge, the remaining laterals have rounded tips (fig.2 l). Each anterior proleg is provided with perhaps about 50 long and rather coarse pectinate setae (fig.5) and many shorter ones. The posterior legs are each provided with a number of claws, those on the periphery as shown on pl.25, fig.9, those in the middle of the foot as shown in fig.8. The papillae upon which the caudal setae are placed are short and pale in color. The anal blood gills are rather long and prominent (pl.25, fig.6). The diameter of the anterior abdominal segments is considerably greater than that of the posterior.

Pupa. Dark fuscous green. Length 2.5 to 3 mm. Respiratory organ slender, broadened toward the apex, its surface roughened (pl.25, fig.4); its length a little greater than the setae at the

caudal end. A side view of the markings of the second, third and fourth segments is shown on pl.25, fig.7; a dorsal view is given in fig.11. On the sixth, seventh and eighth segments the markings are less conspicuous. The microscopic spines, though short, are rather coarser than in allied species. Besides these spines there is usually on each segment a pair of small setae. The caudal appendage consists of the usual genital sacks and six setae, three on each side of the apex.

Imago. (Pl.30, fig.10.) Greenish black; thorax brown; length 2 to 2.5 mm.

Male. Eyes hairy; head deep brown, face between the bases of the antennae yellowish; proboscis, palpi and antennae pale fuscous, the basal joint of the last deep brown; antennal hairs brownish. Palpus with the first joint about as long as broad, second and third about twice as long as broad, fourth about 1.5 times as long as the second. Dorsum of the thorax and the scutellum dusky greenish yellow, the three stripes of the former and the metathorax deep brown. The pleura and the sternum are somewhat paler in color. Sometimes the scutellum and the space between the dorsal thoracic stripes are pale brown. The dorsal surface of the abdomen is velvet black with a slightly greenish tinge, the first segment wholly and the ventral surface of most of the succeeding segments green, posterior margins of each segment subshining black; the venter of the apical segments blackish. Genitalia pure white, similar to that of *Cricotopus* shown on pl.24, fig.10. Upon both the dorsal and ventral surface of each abdominal segment there are two irregular transverse rows of black setae, most numerous on the seventh and eighth segments. These are best seen in a balsam mount. Legs, including coxae, sordidly yellow, the knees sometimes widely, and tips of tibiae slightly darkened, moderately hairy; apex of fore tibiae each with one, middle with two short equal spurs; the posterior tibiae each with one long curved spur, one short one, and a row of slender apical setae. The empodium, at least of the hind feet, is curved and pectinate. The wings are hyaline, the veins distinct, pale fuscous, crossvein not clouded; costa with black setae; venation as figured. Halteres pale.

Female. Like the male, differing only in sexual characters; i. e. the more robust abdomen, form of genitalia etc. In both sexes the fore metatarsus is about 0.6 as long as its tibia. The green of the first abdominal segment is not always distinctly visible.

Var. a. Like the foregoing, but with the abdomen, usually including the venter dull fuscous or brown. Numerous specimens. Ithaca N.Y., Chicago Ill.

16. *Orthocladius pubitarsis* Zetterstedt

- 1838 *Chironomus* Zett. Ins. Lappon. p.811, 11
 1850 *Chironomus* Zett. Dipt. Scand. 9:3514, 30
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.280, 62
 1902 *Orthocladius* Kertesz. Cat'l. Dipt. 1:221
 1845 *Chironomus frigidus* Staeger (nec Zett.). Kröjer: Naturh. Tids. 1:351, 4

Blackish, subopaque, dorsum of thorax with three black stripes; antennae dark, wings white, legs fuscous testaceous, the fore metatarsus nearly as long as its tibia, fore tarsi of the male distinctly pilose; genitalia small, the appendages somewhat leaf-like. Length of the male 3.5 mm.; of the female 3 mm.

Male and female. The fore metatarsus nearly as long as the tibia, male genitalia subovate, and the densely pilose fore tarsi in the male distinguishes this species.

The head, antennae, and palpi blackish. The thorax blackish, or dull cinereous, subopaque, with black stripes. Scutellum and metathorax blackish. Abdomen of the male slender, linear, subopaque, black, fuscous pilose, the incisures narrowly whitish, subshining, the anal appendage short, subovate, black; of the female stouter, blackish, pubescent. Legs of the male fuscous testaceous, the middle and hind legs pubescent; the fore femora and tibiae bare, fore tarsi distinctly and densely pilose; in the female paler, the articulations narrowly blackish. The fore metatarsus nearly as long as the tibia, the second tarsal joint about one half as long. Halteres pale. Zetterstedt, loc. cit. Greenland, Lundbeck.

17. *Orthocladius obumbratus* n. sp.

(Pl.30, fig.11)

Male. Grayish black. Face yellowish, eye margin, occiput, antennae excepting the second joint, black; antennal hairs brownish or blackish, proboscis and palpi fuscous. Thorax opaque, grayish pruinose, the humeri and the anterior margin sometimes indistinctly yellowish, scutellum brown or yellowish brown. Abdomen fuscous with fuscous hairs, genitalia small. Legs fuscous, or subfuscous, middle and hind legs hairy; the trochanters and extreme bases of femora yellow; fore metatarsus about two thirds as long as its tibia. Wings whitish hyaline, anterior veins pale yellowish, posterior veins colorless, crossvein not clouded; R_{4+5} almost straight beyond its middle, bowing only a very little toward the costa; venation as figured. Halteres pale yellow.

Female. Somewhat paler than the male; the dorsum of the thorax has three wide blackish stripes, the space between them

and the humeri yellowish. Abdomen blackish or brownish, venter sometimes yellowish. Wings darker than those of the male, the anterior veins dark, R_{4+5} slightly bowed toward the costa beyond its middle. In other respects like the male. Length, male and female, 2.5 to 3 mm.

In immature specimens the legs and particularly the femora are pale. The paler female specimens resemble *pubitarsis*; the male differs in having no pale margins on the posterior abdominal segments.

Numerous specimens, Ithaca N. Y. Douglass, Alaska.

18. *Orthocladus basalis* Staeger

- 1845 *Chironomus* Staeger. Kröjer: Naturh. Tids. n. s. 1:351, 6
 1872 *Chironomus* Holmgr. Öfv. K. Vet. Akad. Förh. 29:105
 1878 *Chironomus* Ost. Sack. Catl. Dipt. N. A. p.20.
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.279, 60
 1902 *Orthocladus* Kertész. Catl. Dipt. 1:216
 1869 *Chironomus pavidus* Holmgr. K. Svensk. Vet. Akad. Handl. 8:5, 42

The following is Holmgren's description of *pavidus*:

Male. Antennae a little shorter than the thorax, with fuscous black hairs; the joints somewhat separated. Thorax smooth and wholly shining, excepting the scutellum and metanotum; mesothorax with three stripes, the middle one produced anteriorly, and depressed posteriorly in front of the scutellum, with three short projecting points; scutellum obtuse, elevated and pilose. Abdomen black, subopaque, pale haired, the first segment wholly, the posterior margins of the others shining. Wings narrow, cinereous white or slightly smoky, darker along the costa; crossvein straight; subcosta slightly curved, extending to about the middle of the wing, with two distinctly spurious veins (folds?); fork of the cubitus but little distad of the crossvein. Halteres white or yellowish. Legs black fuscous, the middle of tibiae or before the base very frequently paler; the middle and hind legs sparsely haired; the fore tibiae and tarsi very short haired; fore metatarsus about one third shorter than the tibia. Length 3 mm.

Staeger's description of *basalis* is as follows:

Female. Head black, front shining. Thorax with humeri and pleura in front of base of wings yellowish, the dorsum with three confluent black stripes; the sternum grayish black. The coxae shining black. Abdomen velvet black, the first two segments yellowish brown (in fresh specimens perhaps pure yellow), and the posterior margins of the following segments shining black. The wings are somewhat darkened; the anterior veins and the crossveins are dark brown and prominent, the other veins are

indistinct; the subcostal vein ends proximad of the fork of the cubitus. The color of the legs is pitchy brown, the base of the fore femora and the middle of the hind tibiae are somewhat yellowish; the fore metatarsus is about one half as long as its tibia, the second tarsal joint is one half as long as the first.

Landbeck (1898) compared Holmgren's and Staeger's types and declared them identical. Greenland, Washington State.

19. *Orthocladius barbicornis* Linne

1767 *Tipula* Linne. Syst. Nat. Ed. XII, 2:974, 25

1805 *Chironomus* Fabr. Syst. Antl. p.42, 20

1818 *Ceratopogon* Meig. Syst. Besch. 1:71, 4

1864 *Chironomus* Schiner. Fauna Austr. 2:612

1884 *Orthocladius* Mik. Wien. Ent. Zeitg. 3:202

1805 *Chironomus obscurus* Fabr. Syst. Antl. p.40, 11

1818 *Chironomus* Meig. Syst. Besch. 1:47, 60

1850 *Chironomus* Zett. Dipt. Scand. 9:3568

Male. Black, or deep fuscous. Head including palpi and antennae black, the hairs of the latter somewhat paler. Thorax with scutellum and metanotum black. Abdomen slender, black, hairy, incisures scarcely paler; caudal appendages short oval, black. Wings white (pale brownish yellow by reflected light), anterior veins testaceous. Halteres blackish. Legs black or pitchy, occasionally paler, uniformly and distinctly hairy; fore femora and tibiae with long, the tarsi with short hairs. Fore metatarsus one fourth to one third shorter than its tibia; the other joints gradually diminishing in length. Length 4 mm. (Zetterstedt in part.)

Female. Thorax anteriorly with yellowish or yellowish brown spots, representing the remains of a pale ground color; the halteres are paler; the wings darker. (Schiner.)

Some specimens from St. Paul Minn., and from Washington State do not differ from my European specimens.

20. *Orthocladius clepsydrus* Coquillett

1902 *Orthocladius* Coq. U. S. Nat. Museum Proc. 25:92

Female. Black, the extreme bases of femora and of front tibiae, also the other tibiae except their apices, whitish; mesonotum polished, scutellum and dorsum of abdomen opaque, velvet-like; wings hyaline, each marked with an hourglass-shaped black spot extending from one fourth length of wing almost to apex of upper branch of fifth vein (Cu_1), the constricted portion lying above the forking of the fifth vein (cubitus), the basal expanded portion reaching from fourth vein (media) nearly to hind margin of wing, the apical extending from third vein (R_{4+5}) almost to hind margin

of wing; legs only pubescent, first joint of front tarsi about half as long as the tibiae, fourth tarsal joint rather slender and almost as long as the fifth; length 1.5 mm. Las Vegas Hot Springs, New Mexico. (Coquillett, loc. cit.)

Genus 42. Tanytarsus Van der Wulp

Tijdschr. v. Entomol. XVI (LXX) and XVII, 134

Larva. Small species resembling *Chironomus*, occasionally red in color, though more often yellowish. Distinguished from allied genera by their long antennae with elongated apical joints, and the frontal protuberances upon which the antennae are mounted. The epipharynx and its appendages resembles that of *Chironomus* (pl.25, fig.16, and pl.26, fig.14); the maxilla has upon its inner angle one or more spine-like blades which project mesad and cephalad (pl.26, fig.12 mx); the thoracic segments frequently have a few short setae. The ventral surface of the eleventh abdominal segment apparently lacks blood gills.

Pupa. The thorax has a pair of respiratory organs, each of which consists of a central shaft with lateral filaments (pl.26, fig.3). The dorsal surface of the abdominal segments is characteristically marked with hairs and setae (pl.25, figs. 18 and 20, and pl.26, fig.11). The eighth segment has a comb at the caudal end of each lateral fin, and the anal segment has a fringe of hairs forming a paddle (pl.26, figs. 6 and 15).

Imago. (Pl.30, figs. 14 to 21) Antennae of male 14-jointed, long plumose; antennae of female 7-jointed, sparsely haired, first joint in both sexes large and disk-like. Palpi bent, 4-jointed, the last joint usually a little longer than the preceding. The eyes reniform, ocelli wanting. Thorax highly arched, projecting somewhat over the head; metanotum arched. Abdomen of the male slender, the anal segment distinctly separated from the preceding; genitalia long and slender; abdomen of the female shorter and stouter. Legs slender, fore tarsi elongated, the fore metatarsus longer than its tibia; hind legs usually hairy. Wings distinctly hairy; anal angle small; crossvein upon or even proximad of the mid length of the wing; R_{4+5} joins the margin at the extremity of the costa; media simple; the forking of the cubitus is under or just distad of the crossvein; the lower branch is straight or gently bent downwards. Species rather small.

KEY TO SPECIES OF TANYTARSUS

Larvae

- a* Moderate sized pink or red species, with long filaments at the extremity of antenna, pl.26, fig.1a
 - b* With a hump on dorsal surface of last abdominal segment, most distinct in fresh specimens, pl.26, fig.5.....5. *dives* n. sp.
 - bb* Without this hump.....3. *gmundensis*
- aa* Small yellowish species, antennae without long filaments
 - b* Antennae with two delicate processes with slightly enlarged ends at extremity of the second joint, pl.26, figs. 13-14; larva usually found in its fibrous case, pl.26, fig.9.....13. *exiguus* n. sp.
 - bb* Antenna with a pointed process at end of second joint, pl.25, figs. 16, 17.....10. *dissimilis* n. sp.

Pupae

- a* Lateral fin of the eighth abdominal segment with a simple terminal spur, pl.26, fig.15; second abdominal segment with two small patches of setae near the anterior end and a transverse row near posterior end; pupa in a fibrous case, pl.26, fig.9.....13. *exiguus* n. sp.
- aa* Lateral fin of the eighth segment with a comb
 - b* Fourth abdominal segment with two patches of short stout setae on anterior end and a few scattered setae on the surface, pl.26, fig.7
 - 5. *dives* n. sp.
 - bb* Fourth segment with two longitudinal rows of setae caudad of the anterior patch
 - c* With a transverse row of stout setae on posterior margin of third segment, pl.25, fig.20.....10. *dissimilis* n. sp.
 - cc* With two patches of setae near posterior margin of the third segment, pl.25, fig.18.....Var. a. of *dissimilis*

Imagines

- a* Thorax uniformly black or brown; thoracic stripes wanting or very indistinct
 - b* Legs white or pale yellow; wings white; thorax and abdomen subshining black; male abdominal segments with paler posterior margins; fore metatarsus about 0.15 longer than its tibia
 - 1. *obediens* n. sp.
 - bb* Legs dusky yellow, fuscous, or black
 - c* Halteres black or dusky; thorax and abdomen subshining black; fore metatarsus about 0.16 longer than its tibia
 - 2. *nigripilus* n. sp.
 - cc* Halteres pale
 - d* Fuscous, including legs; thorax subshining; fore metatarsus over 0.4 longer than its tibia.....3. *gmundensis*
 - dd* Smaller dark brown or fuscous green species; fore metatarsus less than one fourth longer than its tibia
 - 4. *deflectus* n. sp.

very short-haired, fore metatarsus about one sixth longer than its tibia. Wings cream white, with white veins; venation as figured. Halteres white.

Female. Like the male but with yellow antennae, and the abdomen is nearly uniform in color, paler margins at most but feebly indicated. Length, both sexes, 3.5 to 4.5 mm.

In one male specimen the abdomen is wholly black, and the basal joint of the antenna brown. This fly greatly resembles the female of *Chironomus nigricans* n. sp., from which it may readily be distinguished by its hairy wings. Numerous specimens; Ithaca N. Y., May, June, July. Washington State.

2. *Tanytarsus nigripilus* n. sp.

Resembles *T. sylvaticus* V. d. W., an European species, but differs in having black halteres.

Male. Black, subshining; length 3.5 to 4 mm. Head black; palpi, proboscis and antennae also black, the last with blackish hairs. Thorax wholly subshining black, the dorsum when viewed obliquely from in front with two more distinctly shining black stripes. Abdomen black, subshining, incisures faintly cinereous, hairs black. Claspers slender, brownish. Coxae and legs black, long-haired, particularly the fore tarsi, which are almost bearded; fore metatarsus about one sixth longer than its tibia. Wings hyaline, slightly brownish tinted, anterior veins brownish, posterior ones pale; cubitus forks about under the crossvein. Halteres fuscous or black.

Female. Like the male, but the fore tarsi are less hairy and the halteres are paler. Ithaca N. Y., April. Washington State.

3. *Tanytarsus gmundensis* Egger

1863 *Chironomus* Egg. Verh. z. b. Ges. Wien. 13:1109

1864 *Chironomus* Schiner. Fauna Austr. 2:597, 7

1874 *Tanytarsus* V. d. Wulp. Tijd. v. Ent. 17:134

1877 *Tanytarsus* V. d. Wulp. Dipt. Neerl. p.285

(Pl.30, fig.15)

Male. Fuscous. Head, including palpi, proboscis and antennae fuscous, the last with fuscous hairs. Thorax and abdomen wholly fuscous, the last with yellowish hairs; genitalia brown. Legs fuscous, trochanters and bases of femora yellow; short-haired. Fore metatarsus about 1.5 times as long as its tibia. Wings hyaline, veins near the anterior margin yellowish, and others paler. Halteres yellow.

Female. Like the male but with broader wings. Length 3 to 4 mm. I cannot distinguish the American from my European specimens. Ithaca N. Y., Chicago Ill., Washington State. April and October.

4. *Tanytarsus deflectus* n. sp.

(Pl.30, fig.16)

Female. Brown; abdomen paler. Head, including palpi and antennae brown, second and third joints of the antenna more or less coalescent; rostrum with prominent black setae. Thorax including pleura, pectus, and metanotum, brown; the first with three darker brown stripes; scutellum a little paler. Dorsum of thorax with dark setae. Abdomen uniformly yellowish brown, with black hairs. Legs, including coxae, brownish yellow, the knees slightly darker; quite hairy; fore metatarsus about one fifth longer than its tibia. Wings very hairy, anal lobe not prominent. Halteres white. Length 1.5 to 2 mm.

The respiratory organs of the pupa consist of two slender more or less cylindrical processes armed with one lateral seta at about one third from the apex, and with two or three shorter ones on the apex (pl.22, fig.6). The pupal skin is so mutilated that a further description cannot be given. Several captured and one bred specimen. Ithaca N. Y.

5. *Tanytarsus dives* n. sp.

Larva. The larvae were found in the sand at the bottom of a pool of water, drainings from a pile of manure. Blood red, with a greenish tinge on the sides, and a prominent hump on the anterior part of the dorsum of the last segment (pl.26, fig.5). Length 6 to 7 mm. Head dark, about $1\frac{1}{2}$ times as long as wide, antennae much elongated, about two thirds as long as the head, or fully as long when they are measured to the tips of the two long filaments of the second antennal segment (pl.26, fig.1). The first joint long and slender, with a slender seta on its side, and a spur at the tip near the base of the second segment; second segment about three times as long as wide, with two long slender filaments at the tip near base of third segment. The third and fourth segments slender, delicate, and inconspicuous; these two taken together less than the length of the second joint. The dorsal sclerite of the head not distinctly separated from the laterals. Upon the dorsal aspect of the head are eight pairs of rather long setae, arranged as shown in fig.1. Each antenna is mounted upon a frontal prominence. There are two distinctly separated eye spots upon each side of the head. The labrum is rather more prominent than usual with *Chironomus*, with five or six pairs of conspicuous curved subapical setae, a pair of pectinate hairs, several pairs of smaller setae, and an apical pair of short, jointed papillae. The epipharynx resembles that of *Chironomus*, with its horseshoe shaped ridges, the curved,

overhanging setae, and the transverse comb, the latter having a number of uniform rather long, slender, caudad projecting teeth. Caudad of this are three hand-shaped processes, each with five or six slender, apical, finger-like projections. The lateral arms are prominent, and have enlarged, bifid extremities. Each mandible has a stout subapical and mesad projecting seta, a fringe of subapical hairs, and a slender dorsal, laterad projecting seta (fig.2). The maxilla (fig.4 mx) has a comparatively long palpus (p), a number of small papillae and setae and some mesad curved spines. The hypopharynx has the usual fringe of fine hairs and papillae (fig.4 hy). The labium (l) has about 13 blunt, rounded teeth, the middle one most prominent.

The anterior prolegs have numerous curved, slender, hair-like setae. In nearly mature specimens the thorax is somewhat enlarged. The body has few if any setae. The last segment (fig.5), has a prominent hump near the anterior margin; the posterior prolegs are rather prominent, with a small number of stout claws; each of the dorso-caudal setae tufts is mounted on a prominence. The anal gills are four in number and comparatively short, about twice as long as wide. The larva makes a rough, loose, cylindrical case which partly conceals it.

Pupa. Length 4 to 5 mm. Dusky, with the thoracic respiratory organs each consisting of a single slender shaft, with lateral hairs (fig.3), about as long as a single abdominal segment. The dorsal surface of the abdomen is marked with minute setae, spines, and hairs, as shown in fig.7. This figure shows segments two to six inclusive. The dorsum of the second segment is nearly uniformly covered with fine, very short, microscopic spines, four or five pairs of pale setae and the usual chitinous, longitudinally ridged, posterior margin; the third has anteriorly two patches of short black spines, two patches of fine hairs, the rest of its dorsal surface punctate with minute spines, and five or six pairs of pale setae; the fourth, fifth and sixth segments each have two dense patches of short black spines near the anterior margin, sparsely punctate with minute spines, and provided respectively with about eight, seven and five pairs of pale setae. The eighth segment (fig.6) has the usual lateral fins, with its filaments, and has also the combs, each with five or six prominent black teeth. The caudal fin is fringed with long, pale, matted hairs.

Imago, male. Dusky brown, sometimes blackish, legs yellowish brown; length 3.5 to 4 mm. Head, palpi, proboscis and antennae brown, the hairs of the last also brown. Dorsum of thorax gray pruinose, with three subshining brown or black stripes, humeri sometimes a little yellowish. The pleura, sternum and metanotum subshining black, the last with a narrow longi-

tudinal groove; scutellum sordidly yellow or brownish. Abdomen subshining, fuscous, the sides and venter a little paler, the last two or three segments and sometimes the lateral margins of some of the others black; posterior margins of all the segments slightly paler than the rest of the surface. Genitalia brownish, conspicuous, with four pairs of appendages, the outer pair elongate (pl.33, fig.5). All hairs reddish brown. Coxae dark, legs pale brown, extreme tips of middle and hind tibiae black, fore tarsi moderately hairy, middle and hind legs with long but delicate pale brown hairs. Fore metatarsus over 0.4 longer than its tibia. Wings hyaline, costal margin very slightly yellowish, anterior veins pale yellowish, hairs dusky (pl.30, fig.17). Halteres pale.

Female. Like the male but shorter; antennae yellow; wings more densely hairy, and wider in proportion to its length. Length of male 4 mm., of female 2.5 mm. Ithaca N. Y.

6. *Tanytarsus* sp.

Pupa. Respiratory tubes are very delicate and transparent, each apparently consists of about six long slender filaments resembling those of a *Simulium* pupa, but they appear to be jointed. The dorsal markings of each abdominal segment consist of an anterior and posterior transverse band of moderately coarse, short spines, a central area of very minute spines, arranged as shown on pl.22, fig.13. The lateral fins of the eighth segment terminate in a spiny spur as shown on pl.22, fig.17. The caudal fringe is as usual.

Imago, male. Head yellowish, including proboscis, palpi, and antennae, the basal joint of the last brown. Thorax reddish brown; the narrow space between the three wide brown dorsal stripes and the scutellum yellowish. Abdomen pale brown, venter more yellowish excepting toward the extremity. Incisures but little if any paler, genitalia and the abdominal hairs pale. Legs, including the apical half of the coxae, whitish, the tip of each middle and hind tibia with a minute black circular comb, one tooth of which is prolonged into a spur. Fore metatarsus about one third longer than its tibia. Wings hyaline, with a slight milky tinge, hairs pale, veins colorless. Halteres pale. Length 3.5 to 4.5 mm.

Female. Like the male but abdomen more brownish. Saranac Inn N. Y.

7. *Tanytarsus junci* Meigen

1818 *Chironomus* Meigen. Syst. Besch. 1:50, 68

1874 *Tanytarsus* V. d. Wulp. Tijd. v. Ent. 17:134

1877 *Tanytarsus* V. d. Wulp. Dipt. Neerl. p.287, 9

1898 *Chironomus* Lundb. Vidensk. Meddel. p.283, 69

- 1839 *Chironomus vernus* Staeger (nec Meig.). Kröj. Nat. Tids.
2:580, 70
1850 *Chironomus* Zett. Dipt. Scand. 9:3579, 108
1864 *Chironomus* Schiner. Fauna Austr. 2:597

Antennae and palpi brown; antennal hairs of the male pale brown. Thorax dark green, with three broad, black, longitudinal stripes; the sternum and the metanotum shining black. Abdomen dark olive green; the anal segments of the male rounded, shorter and a little broader than the preceding; the claspers as long as the anal segment, broad in the middle, at the base and at the extremity somewhat narrowed; the abdomen of the female is much darker, almost black. Legs variable, blackish brown to yellowish brown; the forelegs long and slender, the fore metatarsus almost twice as long as the tibia (ratio about 4:7); the second tarsal joint about one half as long as the metatarsus; the following joints gradually decreasing in length; hairs of the legs dense and light brown in color. Halteres whitish. Wings hyaline, appearing grayish owing to its hairs; crossvein a little proximad of the mid length of the wing; the fork of the cubitus directly below the crossvein. Male, length 3 to 3.5 mm; female, 2.5 mm. Translation from V. d. Wulp, loc. cit. Greenland. Lundbeck.

8. *Tanytarsus pusio* Meigen

- 1830 *Chironomus* Meigen. Syst. Besch. 6:256, 117
1850 *Chironomus* Zett. Dipt. Scand. 9:3583, 115
1864 *Chironomus*? Schiner. Fauna Austr. 2:597
1874 *Tanytarsus* V. d. Wulp. Tijd. v. Entom. 17:134
1877 *Tanytarsus* V. d. Wulp. Dipt. Neerl. p.287, 8

Male. Greenish; thorax with three dark stripes. Head greenish, palpi subfuscous, proboscis yellowish; large basal joint of antenna fuscous, the next few joints yellow, the remaining ones dark; hairs subfuscous. Thorax green with three dorsal stripes, the sternum and the metanotum blackish. Abdomen green, darker toward the caudal end; hairs pale; genitalia prominent, yellowish. Legs greenish yellow, the tarsi and the fore femora and tibiae slightly infuscated, middle and hind legs hairy. Fore metatarsus nearly twice as long as its tibia. Wings hyaline, hairy, veins pale, crossvein proximad of the mid length of the wing; fork of cubitus distad of crossvein. Halteres greenish yellow. Length 2 to 3 mm.

Female. The thoracic stripes reddish or brownish, and the abdomen paler green, otherwise like the male.

Near the anterior margin of each segment of the abdomen in some specimens there is a faint indication of a darker fascia. Male and female specimens; Ithaca N. Y. Brookings, S. D.

9. *Tanytarsus fatigans* n. sp.

(Pl.30, fig.18)

Female. Head greenish; palpi, and antennae except basal joint, infuscated; proboscis yellow. Thorax greenish, with three dark subshining, brown or blackish stripes; scutellum and pleura pale greenish or yellow; metanotum and sternum blackish. Abdomen grass-green. Legs pale yellowish, slightly infuscated; hairs not long; fore metatarsus over one third longer than the tibia. Wings hyaline, sparsely haired, veins yellowish, venation as figured. Halteres greenish. Length, 2 to 3 mm.

Var. a. One female specimen has darker face, proboscis, and fuscous legs, otherwise agrees with the above description. Taken at same time and place. Ithaca N. Y., April.

10. *Tanytarsus dissimilis* n. sp.

(Pl.25, figs. 16 to 21)

Larva. Small, white, with brownish tint; found among the trash in the bottom of a muddy pond. Length 3 to 4 mm. Head pale brown, short, with a few dorsal setae. Eye spots, a pair on each side, distinctly separated, antennae nearly double the length of the mandible (fig.17). Labrum with a number of prominent curved setae, some of them pectinate (fig.16 l); epipharynx normal (fig.16). Mandible with a subapical and a lateral seta and a row of fine hairs overhanging the tip. Maxilla with a short palpus, some small papillae and several slender, pointed, mesad projecting lobes (fig.16 mx). The anterior feet are provided with numerous pale curved setae. Thorax with a few pale and very inconspicuous setae. Claws of the posterior prolegs few in number and bilobed. Caudal blood gills four in number and rather prominent. Caudal setae brown; a single shorter and more delicate seta is placed upon each pedicel upon its anterior side.

Pupa. Pale yellowish; length about 3 mm. Thorax with long, slender pointed respiratory organs with hairs upon them. Upon the thorax caudad of the middle are a few rather conspicuous setae. The second, third, fourth and fifth abdominal segments are marked as shown on pl.25, fig.20. The second has two gray triangular pigment spots, their bases near the posterior margin; a few small setae, and the usual transverse posterior row of longitudinal ridges; the third has a broken transverse posterior row of long and prominent black setae, besides a few scattered ones; the fourth has an anterior row which joins the cephalic ends of the two longitudinal rows of long black setae and an anterior median patch of short, stout, black spines, besides several scattered setae; the fifth has two contiguous or nearly contiguous patches near the anterior margin of short stout black spines, and

a pair of discal setae. The lateral fin of the eighth segment terminates in a comb with six or seven short black teeth. The caudal fin is elongate and has the usual fringe of matted hairs.

Imago. Differs from *T. exiguus* n. sp. in being darker, in having a shorter metatarsus, and in the form of the male genitalia. It is yellowish green, sometimes nearly wholly yellow, more or less infuscated, with three brown thoracic stripes.

Male. Head yellow, including proboscis, palpi and the large basal joints of the antennae; the antennae brown, the basal portion of each hair appearing paler; eyes black. Thorax yellow, slightly infuscated, with a greenish tinge, usually with three more or less distinct buff or pale brown, sometimes darker, stripes. Abdomen green, slender, yellow toward tip; genitalia elongate (pl.33, fig.3), with a dorsal downward curved keel (d), and four pairs of appendages; an elongated pair of lateral lobes (l), a pair of inferior lobes (i) with rounded ends, a pair of short, blunt, superior lobes (s) with much incurved ends, and finally a pair of brush-like appendages (a) projecting mesad from the side of the superior lobes. Legs hairy, uniformly light yellow, sometimes slightly infuscated, tips of middle and hind tibiae each with a pair of minute black combs with an elongate middle tooth, forming a spur. Fore metatarsus about one half longer than its tibia. Wings pale, hairy, the heavier veins close to the anterior margin, all veins pale yellow. Halteres white. Length 1.75 to 2.25 mm.

Female. Like the female of *T. exiguus* n. sp. but is considerably darker yellow; the thoracic stripes are brown, metathorax brown, abdomen deeper green, the legs pale grayish yellow, sometimes fuscous. In dried specimens all colors appear rather dusky. Length 1.25 to 1.75 mm. Proportion of metatarsus to its tibia like that of the male.

This species was bred a number of times during May, July, and October from pond water. Ithaca N. Y., Ottawa, Canada (from Professor Fletcher).

Var. a. Larva can not be distinguished from the foregoing; the pupa differs in having fewer setae upon the dorsum of abdomen. (See fig.18 for the arrangement of these setae.) This variety has been bred several times. There seems to be no intermediate stage. The adults of this variety seem to be a little more dusky than those of the other.

11. *Tanytarsus fulvescens* n. sp.

(Pl.30, fig.19)

Male. Testaceous; segments of the abdomen brown with paler posterior margins. Length 3 mm. Head with palpi, proboscis, and antennae, and its hairs brownish. Dorsum of the thorax, pleura and scutellum testaceous, with cinereous reflections; the

three dorsal stripes, the sternum and the metanotum brown, the long hairs in the longitudinal rows and those on the scutellum brown. Abdomen brown, with blackish hairs, posterior margins of the segments cinereous white; the genitalia brown, the lateral lobes long and stout. Legs yellowish or testaceous, the tarsi a little darkened, fore legs with short, the middle and hind legs with long hairs. Fore metatarsus about one fourth longer than its tibia. Wings hyaline, appearing somewhat dusky on account of the dark hairs which cover them; veins yellow, margin deeply fringed, venation as figured. Halteres yellow, the knob sometimes slightly infuscated.

Female. Face, basal joints of the antennae and the hairs of the thorax more yellowish; otherwise like the male. Ithaca N. Y. July.

12. *Tanytarsus muticus* n. sp.

(Pl.30, fig.20)

Male. Yellowish, with three reddish brown thoracic stripes. Head yellowish or greenish, palpi and proboscis yellow; antennae including the hairs and the basal joint brownish. Dorsum of the thorax greenish yellow, with three broad reddish brown stripes, metathorax and sternum brown; scutellum and pleura yellowish. Abdomen greenish, yellow, somewhat infuscated. Hairs pale; genitalia yellow in color and elongate. Legs yellow, somewhat darkened, except the trochanters and bases of femora; the middle and hind pairs longer haired than the fore pair; fore metatarsus one third or one fourth longer than its tibia. Wings hyaline, hairy, veins pale yellow; venation as figured. Halteres yellow. Length 2.5 to 3 mm. Ithaca N. Y.

13. *Tanytarsus exiguus* n. sp.

Larval case. Numerous fibrous, slender, conical cases are found attached to the rocks in the bottom of shallow brooks in places where the water flows most swiftly during the summer months. Hundreds of these cases may be sometimes found upon a single piece of rock no larger than a man's hand. The cases are slender, conical, with a basal stem and three, or occasionally four, apical filaments; the body is about 3.5 to 4 mm. in length. The color is a pale brown like that of dried grass; the structure is fibrous like that of a *Simulium* case. The case is reinforced longitudinally by three ribs, the basal prolongations of the filaments; the stem is slightly enlarged at the base, by which it is attached to the rocks. During the early summer most of the cases will be found attached by the stem alone, but later in the season most of them lie flat on the rock and are attached along one side like *Simulium* pupal cases. Within this case is a small greenish yellow larva, or later,

the tiny pupa. The case is shown on pl.26, fig.9. Ulmer (p.401, 1903) notes a similar structure for an European species.

Larva. (Pl.26, figs.8 to 15). The larva is pale greenish yellow, with a brownish yellow head and elongate antennae; the length is from 3 to 4 mm. Head about 1.5 times as long as wide, with a number of short setae, two at the base of each antenna, two on the front, one mesad, one laterad and one in front of each pair of eyes. There are two eye spots on each side (figs.8 and 14). The antennae (fig.13) are over one half as long as the head, each mounted upon a lateral prominence. The first joint is three times as long as the second, and has a seta on its side a little distad of the middle, and an apical seta 1.5 times as long as the second joint, the latter having two apical setae with rounded ends. The third joint is shorter than the second, the fourth is shorter than the third, the latter has a delicate apical seta. All setae are very pale yellow in color. The labrum is prominent and has two pairs of stout apical setae, one pair of which is curved and elongated (fig.14); besides this there are five or six pairs of smaller lateral setae. The epipharynx is like that of the genus *Chironomus*, with the usual comb, curved setae, and bifid lateral arms. The mandibles (md) have black tips, the maxillae (figs.12 and 14 mx) each have a prominent palpus and an elongate mesad projecting process with several blades, very delicate and transparent; the brown labium with its black teeth has an outline as figured (fig.12 l). The prolegs have the usual curved hairs. Each segment of the thorax has a very few scattered setae arranged in two transverse rows. The abdomen is practically devoid of setae. The last segment has the usual dorsal tufts of setae, four short though conspicuous blood gills, and prolegs with their retractile bilobed claws.

Pupa. Pale yellow, with brownish thorax, length about 2.5 mm. The respiratory organs are slender, unbranched, pointed filaments, and bare; about one third the length of the thorax. The second, third, fourth, fifth and sometimes the sixth segment of the abdomen is dorsally marked with a pair of brown spots, upon which are a number of short brown setae, near the anterior margin. The second segment has in addition a transverse row of much finer microscopic spines near the posterior margin, and the usual transverse ridged row upon the posterior edge (fig.11). There are also a very few scattered minute setae. Each lateral fin of the eighth segment has four pale, slender filaments and a single brown apical spur. The caudal fin has the usual fringe of long matted hairs or filaments (fig.15).

Imago, male. Pale yellow, abdomen pale yellowish green. The head with proboscis and palpi pale yellow; antenna somewhat

infuscated, with pale hairs, basal joint yellow; palpi elongate; the eyes conspicuously black, deeply notched. Thorax wholly yellow, with three buff-colored, sometimes indistinct, dorsal stripes. Abdomen quite pale green, very slender and with pale hairs; genitalia (pl.33, figs.4 and 4a) yellow, with four pairs of appendages; an elongate pair of lateral lobes with upturned ends (l), a pair of elongate inferior lobes with rounded ends (i), a pair of short superior lobes with sharp apex and recurved setae (s), a pair of mesad projecting brushlike appendages (a), and finally a curved dorsal keel (d). Legs wholly cream white, tips of middle and hind tibiae each with two tiny black combs, one tooth of each comb being prolonged into a short spur. Legs rather hairy; fore metatarsus nearly three fourths longer than its tibia. Wings white, hyaline, spotless, hairy, margin with long fringe, veins pale. Anterior veins closely crowded towards costal margin, so that the veins are difficult to distinguish. Halteres white. Length 1.5 to 2 mm.

Female. Like the male, differing only as follows: A little shorter, antennae yellow, last joint dark on the lateral surface; abdomen shorter and broader, and often entirely yellow, though sometimes green.

This species is very common among the shrubbery near swift-flowing brooks. Ithaca N. Y.

14. *Tanytarsus tenuis* Meigen

1830 *Chironomus* Meigen. Syst. Besch. 6:255, 112

1850 *Chironomus* Zett. Dipt. Scand. 9:3581, 113

1864 *Chironomus* Schiner. Fauna Austr. 2:598

1874 *Tanytarsus* V. d. Wulp. Tijds. v. Ent. 17:134

1877 *Tanytarsus* V. d. Wulp. Dipt. Neerl. p.288, 11

1898 *Chironomus* Lundb. Vidensk. Meddel. p.284, 70

Pale greenish yellow; dorsum of the thorax with three ferruginous longitudinal stripes; sternum and metathorax also ferruginous. Abdomen of the male very slender, somewhat darkened toward the end, and with long claspers. Antennae yellowish, the hairs appearing lighter; palpi dark brown. Legs pale yellow, the tibiae with black spots at the tip; fore metatarsus twice as long as its tibia. Wings whitish, delicately haired. Halteres pale yellow. Length 2 to 3 mm. Schiner, loc. cit. Greenland. Lundbeck. Specimens from South Dakota and Washington seem to be this species.

15. *Tanytarsus flavellus* Zetterstedt

1838 *Chironomus* Zett. Ins. Lappon. p.816, 41

1850 *Chironomus* Zett. Dipt. Scand. 9:3584, 117

1864 *Chironomus* Schiner. Fauna Austr. 2:598

1874 *Tanytarsus* V. d. Wulp. Tijdschr. v. Ent. 17:134

1877 *Tanytarsus* V. d. Wulp. Dipt. Neerl. p.288, 12

(Pl.30, fig.21)

Head, antennae and palpi pale yellow; the antennal hairs of the male brownish yellow; tip of the palpus brownish; eyes black. Thorax, scutellum and metathorax pale yellow, the thoracic stripes pale ferruginous; abdomen pale green; the claspers pale yellow. Legs and halteres pale yellow; fore metatarsus about 2.5 times as long as its tibia. Wings with yellowish tint, pale veins and densely haired. Length 1.25 to 1.5 mm. Translation from V. d. Wulp. Several specimens; Ithaca N. Y.

Tanytarsus (?) sp.

This is a very peculiar little larva from Saranac Inn N. Y. which I doubtfully refer to *Tanytarsus*, though it may belong to some one of the other genera, *Chasmatonotus*, *Eurycnemus*, etc., the larvae of which have not yet been described as far as I am aware.

Larva pale yellowish, length about 2.5 mm. It was found in a little case constructed of grains of sand like those of some caddisflies. A dorsal view of the head is shown on pl.20, fig.10. The head is about $1\frac{1}{2}$ times as long as wide, dark brown in color. There are a number of setae upon the dorsal surface, distributed as in the figure; on the posterior part are about 12 blunt tubercles; at the base of each antenna (a) is a peculiar process with sharp, finger-like projections (b). The antennae are wanting in the single specimen, but judging from the size of the basal articulations they are probably considerably elongated. The labrum possesses prominent setae; the epipharynx is provided with the usual transverse comb, prominent and elongate lateral arms, and curved setae. The mandible is stout and has a prominent lateral subapical seta. The maxilla has a prominent palpus, and the labium has a toothed margin much resembling the one shown on pl.22, fig.7, but with the central tooth somewhat wider and with but 13 instead of 15 teeth. The anterior prolegs have a number of slender, curved, pale setae, not pectinate. Upon the dorsal surface of the thoracic segments are a few long, slender, pale setae. The posterior end of the abdomen is wanting in this specimen.

Genus 43. *Eurycnemus* Van der Wulp

Tijdschr. v. Entom. XVI (LXX) and XVII, 135

Imago. Head flat in front, covered by the conically produced thorax; front broad, arched; eyes small, reniform; ocelli wanting.

Antennae of the male as long as the head and thorax taken together, 14-jointed, the first joint short, disk-like, the following joints densely plumose; the antennae of the female shorter, 7-jointed, with a few erect hairs. Proboscis short, palpi curved, 4-jointed, the joints of about equal length. Thorax and abdomen hairy, the thorax strongly developed, highly arched, conically produced in front; scutellum and metanotum arched; the sternum projecting almost nipple-like from between the fore and middle legs (pl.34, fig.24). Abdomen cylindrical, the genitalia moderately enlarged; legs thickly haired, the apical ends of the femora and all of the tibiae, particularly the hind ones, thickened; the fore metatarsus about one fourth shorter than the fore tibia, upon each side with long cilia. Wings long and narrow, thickly haired; the anal angle prominent; R_1 and R_{4+5} straight, the latter ending at the end of the costa; crossvein proximad of the mid length of the wing; media unbranched, almost straight and entering the margin immediately below the apex of the wing; the fork of the cubitus distad of the crossvein; both branches bent gently downward; humeral crossveins quite distinct. V. d. Wulp, loc. cit.

KEY TO THE SPECIES OF EURYCNEMUS

Larvae and pupae of the species of this genus have never been described as far as I am aware. Walker's two species may not belong to this genus, but are placed in the following key because of that author's statement "allied to *aestivus*."

Imagines

- a* Thoracic stripes and fasciae on abdominal segments brown; length 4 mm.
(N. J.).....1. *scitulus*
- aa* Thoracic stripes yellow
 - b* Thorax yellow; length 5.5 mm.....2. *unicolor*
 - bb* Thorax green with orange colored stripes; length 9 mm.

3. *lasiomerns*

1. *Eurycnemus scitulus* Coquillett

1901 *Eurycnemus* Coq. Proc. U. S. Nat. Mus. 23:608

Female. Yellow, the palpi, apices of antennae, four vittae on the mesonotum, a small spot below and slightly in front of each wing, the metanotum, except the upper margin and sides, a broad fascia at base of abdominal segments two to seven; the knees, apices of tibiae and of tarsal joints, dark brown; mesonotum sub-opaque, front tarsi bare; wings almost wholly covered with brown hairs grayish hyaline, the portion in front of the first (R_1) and third (R_{4+5}) veins pale brown; veins brown; length 4 mm. Habitat: Riverton, New Jersey.

2. *Eurycnemus* (?) *unicolor* Walker

- 1848 *Chironomus* Walk. List Dipt. Brit. Mus. 1:19
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Female. Body hairy, saffron or pale orange color; feelers yellow; eyes black; legs pale yellow, very hairy; wings colorless, hairy, fringed; veins yellow; poisers pale yellow. Length of body 5.5 mm.; of wings, 9 mm. Nova Scotia. Allied to *aestivus*.

3. *Eurycnemus* (?) *lasiomerus* Walker

- 1848 *Chironomus* Walk. List Dipt. Brit. Mus. 1:19
 1878 *Chironomus* Ost. Sack. Cat'l. Dipt. N. A. p.21

Male. Wings hairy. Head orange; feelers very downy; their hairs yellow; chest green; the usual three stripes orange colored; abdomen yellow, thickly fringed with hairs along each side; legs yellow, hairy, especially the feet and the tips of the shanks of the fore legs; wings white; veins pale yellow; poisers yellowish white. Length of body 9 mm.; of wings 12 mm. St Martin's falls, Albany river, Hudson's bay.

This species has the chest produced in front like *C. aestivus* Curtis (= *C. hirtipes* Macq.) to which it is nearly allied. Walker, loc. cit. *C. aestivus*, mentioned above, is a synonym of *elegans* Meig., the type species of the genus *Eurycnemus*.

Genus 44. *Metriocnemus* Van der Wulp

Tijd. v. Entom. XVI (LXX) and XVII, 136

Imago. Antennae of the male fourteen-jointed, long and densely plumose; antennae of the female seven-jointed, with a few suberect hairs; in both sexes the first joint is thick, disk-like. Proboscis short, palpi bent, four-jointed. Eyes emarginate, ocelli wanting. Thorax highly arched, more or less produced over the head, sternum strongly arched. Abdomen as in *Chironomus*; in the male the anal is distinctly separated from the preceding segments, and is provided with a pair of filiform or sometimes widened claspers (pl.33, figs. 6, 8). Legs slender, the hind legs hairy, fore metatarsus shorter than its tibia. Wings hairy, particularly toward the tip; anal angle prominent; the vein R_{4+5} straight and running parallel with the distal end of R_1 and ending a short distance before the tip of the costa; the crossvein is at or even a little proximad of the mid length of the wing; the media is simple; the fork of the cubitus is directly under or even a little

distad of the crossvein; both branches gently bent downward toward the hind margin of the wing; humeral crossvein more or less distinct. Small species usually not exceeding 4 mm in length. V. d. Wulp, loc cit. For a characterization of larva and pupa, see M. knabi.

KEY TO SPECIES OF METRIOCNEMUS

Imagines

- a Yellowish species
 - b Abdomen brown with the incisures more or less yellow
 - c Fore metatarsus about two thirds as long as its tibia; length 1 to 1.33 mm. 1. *nanus*
 - ce Fore metatarsus about 0.8 as long as its tibia; length 3 mm. 2. *flavifrons* n. sp.
 - bb Abdomen chiefly yellow
 - c Large species 6 or 7 mm. in length; thorax yellow with three brownish stripes, and yellow abdomen with brown spots 3. *par.* n. sp.
 - cc Smaller species with abdomen nearly uniformly yellow
 - d Species having wings only sparsely haired; the posterior branch of the cubitus suddenly deflected; abdomen yellow; length 2 to 3 mm. (Greenland). (See *Camptocladus graminicola*)
 - dd Not as above
 - e R_{4+5} short, ending far before the tip of the wing; halteres white; length 1.25 to 1.75 mm. (Greenland) 4. *debilipennis*
 - ce R_{4+5} extends nearly to the tip of the wing; halteres yellow 5. *lundbeckii* nom. nov.
 - aa Grayish, brown, or blackish species
 - b Thorax with three blackish stripes; ground color yellow; scutellum and metanotum black; legs sordidly yellow or pale fuscous; fore metatarsus about two thirds as long as its tibia; abdomen fuscous; male; length 2 mm. 6. *exagitans* n. sp.
 - bb Not as above
 - c Legs yellow
 - d Thorax gray with black stripes; abdomen usually with whitish incisures; fore metatarsus nearly as long as its tibia; length 3 mm. 7. *incomptus*
 - dd Thorax with yellow ground color and blackish stripes; abdomen with posterior margins of segments yellow; fore metatarsus 0.8 as long as its tibia. 2. *flavifrons* n. sp.
 - cc Legs black or brown
 - d Smaller species; length 1.5 to 2 mm.
 - e Halteres black; dull black, resembling *Orth. stercorarius* 8. *atratus*
 - ce Halteres white; black; metanotum somewhat polished 11. *knabi*

dd Larger species; if 2 to 2.5 mm., then velvet black, and otherwise not as above

e Legs long and densely haired; fore metatarsus two thirds as long as its tibia; length 3 to 4 mm. (Greenland)

9. *ursinus*

ee Legs sparsely haired; male velvet black, female dull; fore metatarsus but little over half as long as its tibia

10. *fuscipes*

NOTE.—Consult also auxiliary key containing Walker's species, p.198.

1. *Metriocnemus nanus* Meigen

1818 *Chironomus* Meigen. Syst. Besch. 1:50, 69

1874 *Metriocnemus* V. d. Wulp. Tijd. v. Ent. 17:136

1877 *Metriocnemus* V. d. Wulp. Dipt. Neerl. p.292, 4

Antennae and palpi dark brown; head and thorax yellowish green, the stripes grayish black, the sternum black. Abdomen brown above with pale incisures, the venter pale yellow. Legs brown. Wings hyaline, the veins somewhat brown. Halteres white. Length, male, 1.33 mm.; female, 1 mm. Meigen, loc. cit.

This species is said to occur in Greenland (Lundbeck). The identification being doubtful, Lundbeck redescribed the Greenland specimens. For these I propose the name *lundbeckii* (see no. 5.)

2. *Metriocnemus flavifrons* n. sp.

(Pl.31, fig.1)

Male. Head yellow, proboscis and palpi fuscous, the first joint of the antenna shining brown, the second yellow, the remaining joints and the hairs fuscous. Eyes black. Dorsum of the thorax yellow with three dull, dark brown stripes, sparsely covered with pale hairs. Pleura yellow, scutellum, metanotum, and sternum dark brown. Abdomen dark brown with the posterior one third of each segment yellow; hairs and the genitalia pale brown. Coxae brown, legs yellowish, the tarsi slightly infuscated, legs very sparsely haired, anterior metatarsus about four fifths as long as its tibia. Wings hyaline, hairy, R_{4+5} straight and ends close to the tip of the wing; halteres pale. Length 3 mm.

Female. Like the male, but has wider wings; venation as figured. Ithaca N. Y., July.

3. *Metriocnemus par* n. sp.

(Pl.31, fig.2; pl.33, fig.6)

Male. Yellow, the antennae except the basal joint, apices of front femora, of their tibiae and of the first two tarsal joints, the whole of the remaining joints, also the last two on the other

tarsi, brown; a pair of rather large black or dark brown spots on abdominal segments two to seven, last segment and the genitalia (pl.33, fig.6) also brown; mesonotum marked with three darker yellow or brownish vittae, the middle one divided, hairs of the antennae brownish; front tarsi destitute of long hairs, middle and hind legs rather hairy, the fore metatarsus about three fourths as long as its tibia, the fourth joint of the tarsi more than one fourth as long as the first; wings hairy, whitish hyaline, the veins yellowish; venation as figured; length 6.5 mm. In one specimen, the one with the darker thoracic vittae, the tips of the middle and hind femora and tibiae are darkened. Axton, N. Y. A female specimen from New Jersey has dark brown thoracic stripes and larger spots on abdomen.

In the paper by Messrs MacGillivray and Houghton in the Entomological News, January, 1903, this fly was identified as *Orthocladius* par Coq., with the description of which it agrees pretty well except for its hairy wings; the latter fact I had overlooked.

4. *Metriocnemus debilipennis* Lundbeck

1898 *Chironomus* Lundb. Vidensk. Meddel. p.286, 76

1902 *Metriocnemus* Kertész. Cat'l. Dipt. 1:229

Male. Thorax yellow, with three brown stripes, the median one posteriorly, the lateral ones anteriorly abbreviated, the pleura yellow, the sternum brownish gray, the scutellum yellow, the metathorax brown. Abdomen yellow, with yellow pile. Antennae brown; the palpi sordidly yellow. Legs yellow, the halteres white. The wings whitish hyaline, hairy, the anal lobe but little produced, obtuse-angled, R_1 and R_{4+5} run close together, the latter much shortened, and runs into the costa far before the tip of Cu_1 ; the media runs into the tip, the base of the fork of the cubitus is a little distad of the base of R_{4+5} , the lower branch is a little curved at the tip. The middle and hind legs are distinctly pilose, the anterior metatarsus is a little shorter than the tibia.

Female. A little shorter than the male, also a little paler, the wings wider and more hairy, the anal lobe more widely rounded; in other respects like the male. Length, male and female, 1.25 to 1.75 mm. Greenland. Lundbeck, loc. cit.

5. *Metriocnemus lundbeckii* nom. nov.

1898 *Chironomus nanus* Lundb. (nec Meig.). Viden. Med. p.285

Male. Thorax yellow, in dried specimens often sordidly yellow or fuscous, with three brown stripes, the middle one abbreviated

posteriorly or less distinct, the lateral ones anteriorly abbreviated; the pleura yellow, the sternum brown, the scutellum yellow, the metathorax more or less dilutely brown. Abdomen yellow with yellow pile. Antennae dilutely brown or yellow; the palpi yellow. Legs and halteres yellow. Wings whitish hyaline, moderately hairy, the anal lobe not produced, widely rounded, the veins thin and pale, toward the costa a little stronger, R_{4+5} straight, its apex nearly over the tip of Cu_1 ; the costa is produced a little beyond the tip of the radius, the media runs into the tip, the posterior branch of the cubitus is suddenly deflected. The middle and hind legs are hairy; the fore metatarsus is a little shorter than its tibia.

Female. Shorter than the male, its thorax a little paler, the wings a little more hairy; in other respects like the male. Length 1.5 to 2 mm. Southern Greenland. Lundbeck, loc. cit.

Var. a. (Pl.31, fig.3.) Some Ithaca specimens agree very well with the above description, but the palpi are pale fuscous instead of yellow, and the sternum is dusky yellow instead of brown. The fore tarsi are slightly infuscated and the posterior branch of the cubitus is suddenly deflected near the end similar to but in less degree than in *Camptocladus*; in the latter respect it differs particularly from my specimens of *M. nanus* Meigen. The fore metatarsus is about three fourths as long as its tibia.

Var. b. A specimen from Chicago is wholly yellow; the mouth parts, antennae, three thoracic stripes, a spot on the pleura, the metanotum and sternum, brown. The legs, excepting the coxae and trochanters, somewhat infuscated. Wings hyaline, hairy, anterior veins slightly yellow. Halteres yellow. Length 2.5 mm.

6. *Metriocnemus exagitans* n. sp.

(Pl.31, fig.4)

Male. Head yellowish, palpi and antennae fuscous, proboscis yellowish; dorsum of thorax with three subshining blackish stripes, the middle one divided; the plura, humeri, and space between the dorsal stripes, yellow; a spot on the pleura, the sternum, scutellum and metanotum subshining black. Hairs on dorsum black. Abdomen wholly fuscous or subfuscous, the hairs and the genitalia somewhat paler. Coxae fuscous, the trochanters and bases of femora yellow; remaining parts of the legs sordidly yellow or pale fuscous; the fore metatarsus about two thirds as long as its tibia. Wings hairy, hyaline, very slightly smoky; R_{4+5} extends nearly to the tip of the wing; costa extends a little beyond the tip of R_{4+5} ; venation as figured. Halteres yellowish. Length 2 mm. Two specimens, Ithaca, N. Y.

7. *Metrioctenemus incomptus* Zetterstedt

- 1838 *Chironomus* Zett. Ins. Lappon. p.816, 42
 1850 *Chironomus* Zett. Dipt. Scand. 9:3586, 121
 1864 *Chironomus* Schiner. Fauna Austr. 2:607
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.285, 73

Gray; dorsum of the thorax with three black longitudinal stripes, which are often indistinct; the metanotum blackish; the abdomen with pale incisures, at the base sometimes lighter. Head dark; the palpi pale yellow, the antennae testaceous. Legs pale yellow, the coxae and all the articulations brown or at least darker; fore metatarsus but little shorter than its tibia. Wings whitish, spotless, thickly haired; the halteres pale. Length 3 mm. Schiner, loc. cit. (Greenland, Lundbeck.)

The fly described by Van der Wulp as *M. incomptus* is a synonym of *M. modestus* Meigen according to Kertész (1902).

8. *Metrioctenemus atratulus* Zetterstedt

- 1850 *Chironomus* Zett. Dipt. Scand. 9:3590, 128
 1864 *Chironomus* Schiner. Fauna Austr. 2:608, 56
 1884 *Metrioctenemus* Mik. Wien. Ent. Zeitg. 3:202
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.285, 74
 (Pl.31, fig.5. pl.33, fig.8.)

Resembles *Orthocladus stercorarius* Deg., but differs in having hairy wings. Dull black; abdomen black-haired; the anal segment wider. Antennae and its hairs black. The legs black, the tarsi brown; the fore metatarsus but little more than one half as long as its tibia. Halteres black; wings white, with a darker stripe at its base; delicately haired. Length 1.5 to 2 mm. Schiner, loc. cit. (Greenland, Lundbeck.)

Several specimens from Ithaca, N. Y., agreeing with the above description have the thoracic hairs, especially of the male, pale brown.

9. *Metrioctenemus ursinus* Holmgren

- 1869 *Chironomus* Holmgr. K. Svensk. Vet. Akad. Handl. 8:5, 39
 1898 *Chironomus* Lundb. Vidensk. Meddel. p.284, 71
 1902 *Metrioctenemus* Kertész. Catl. Dipt. 1:232
 1865 *Chironomus arcticus* Bohem. Öfv. K. Vet. Akad. Förh. p.574, 19
 1845 *Chironomus aterrimus* Staeger (nec Meig.). Kröjer. Naturh. Tids. 1:353, 8
 1878 *Chironomus* Ost. Sack. Catl. Dipt. N. A. p.20

Male. Head black; antennae fuscous black, densely plumose, basal joints of the flagellum stouter. Thorax black, subopaque,

in some lights shining cinereous; black bristled, especially on the sides in front of the wings; scutellum obtuse, black bristled. Abdomen black and black-haired, the anal segment obtuse, flattened (after death), the appendages bearded. The wings cinereous whitish, toward the costa somewhat infuscate, the tip hairy, especially in the radial cell, the remaining surface nearly bare; the posterior margin ciliate. Halteres fuscous black. The legs fuscous black and long-haired except the fore tibiae and tarsi, which are short pilose; fore metatarsus one third shorter than its tibia.

Female. The thorax and abdomen with pale setae, the wings somewhat hairy; the halteres fuscous black or sometimes pale fuscous. Length 3 to 4 mm. Holmgren, loc. cit. (Greenland, Lundbeck.)

Lundbeck (1898 p.284) in a note states, "The wings are very sparsely haired and only toward the apex, the wing of the female being a little more hairy between the branches of the radius than that of the male. The hairs seem to rub off readily, and hence many specimens are found with only a trace."

10. *Metriocnemus fuscipes* Meigen

- 1818 *Chironomus* Meig. Syst. Besch. 1:49, 65
- 1850 *Chironomus* Zett. Dipt. Scand. 9:3578, 107
- 1864 *Chironomus* Schiner. Fauna Austr. 2:607
- 1874 *Metriocnemus* V. d. Wulp. Tijds. v. Ent. 17:136
- 1877 *Metriocnemus* V. d. Wulp. Dipt. Neerl. p.291, 2
- 1898 *Chironomus* Lundb. Vidensk. Meddel. p.284, 72
- 1865 *Chironomus carbo* Phil. Verh. z. b. Ges. Wien. 15:600, 11
- 1818 *Chironomus picipes* Meig. Syst. Besch. 1:25, 74
- 1850 *Chironomus* Zett. Dipt. Scand. 9:3589, 125
- 1864 *Chironomus* Schiner. Fauna Austr. 2:612
- 1878 *Chironomus* Ost. Sack. Catl. Dipt. N. A. p.21

Black, not shining; the anal segment of the male wider than the preceding one. Forceps small, its arms rather robust. Palpi and antennae black, the hairs of the latter sometimes tinged with brown. Legs black, or pitchy; fore metatarsus about one half as long as its tibia. Wings pale brownish or whitish according to the incidence of the light; the hairs dark, more perceptible at the tip; fork of the cubitus distad of the small crossvein. Halteres of the male black, of the female pale. Length 3 to 4.5 mm. Schiner and V. d. Wulp, loc. cit. (Greenland, Lundbeck.)

The species described by Zetterstedt appears to be different, judging from the different relative lengths of fore tibia and metatarsus.

The following is Meigen's description of *M. picipes*:

Wholly velvet black, including antennae and halteres; only the legs are pitchy, and the wings are grayish, hairy. Length 2 to 2.5 mm. (Greenland, Staeger.)

11. *Metriocnemus knabi* Coquillett

1904 *Metriocnemus* Coq. Canadian Entomologist. p.11

Larva. Pale yellow; head dark yellow; eyes, apical half of the mandibles, margin of the labium, dark brown. Claws of both fore and hind prolegs yellow; the dorso-caudal papillae yellow, with about six black setae. Head short, about 1.5 times as long as wide; antennae short like *Chironomus*; eye spots small, each composed of two confluent pigment spots, the anterior one



Fig. 16 Ventral aspect of larval mouth parts of *Metriocnemus knabi* x180

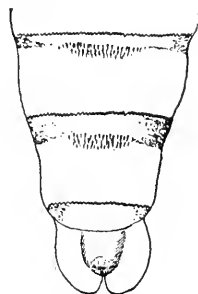


Fig. 17 Dorsal aspect of caudal end of pupa of *Metriocnemus knabi* x180

smaller. Mouth parts resembling those of *Orthocladus*, the mesad projecting processes of the maxillae spine-like, the palpi small; the labrum, epipharynx, lateral arms and hypopharynx as in the above-mentioned genus. Labium with the first and second pairs of lateral teeth smaller than the third, fourth and fifth pairs. Anterior prolegs with simple setae (i. e. not pectinate), at the base punctate with groups of minute and very short spines. The claws of the posterior prolegs of two sizes, the laterals slender, the peripherals shorter, stouter and broadened at base. There are four anal blood gills on the 12th segment but the ventrals of the 11th segment appear to be wanting. The dorso-caudal papillae are more than three times their diameter in length, in this respect resembling *Tanytus*. At the apex of each papilla there are about six long black setae.

Pupa. It resembles an *Orthocladus* pupa, but the breathing trumpets are apparently wanting. The dorsal posterior margin of each abdominal segment minutely scalloped. Near the anterior

margin of each segment there is a transverse patch of short, fine setae with stout bases. The last segment terminates in a bilobed paddle. The genital sack of the male pupa is longer than that of the female. The specimens of larvae and pupae upon which these descriptions are based were obtained from Mr. Fred Knab.

Imago, male and female. Black, knobs of the halteres whitish, hairs of antennae brown, those of the body yellowish; mesonotum somewhat polished, front tibiae twice as long as the first joint of their tarsi, hind tibiae outwardly fringed with rather long hairs, all tarsi with a short pubescence, but without hairs, the fourth joint slender and longer than the fifth; wings grayish hyaline, densely covered with brown hairs, third vein (R_{4+5}) almost straight; length 1.25 to 2 mm. Westfield, Massachusetts. Description of the imago from Coquillett; loc. cit.

The male genitalia of the type shown on pl.33, figs. 1, 2 and 8.

Genus 45. *Scopelodromus* Chevrel

Arch. de Zool. Exp. et Gen. 4 ser. 1:1. 1903.

This genus as defined by its author appears to be closely related to or identical with *Thalassomyia*. Antennae in both sexes seven jointed; the first joint disklike, the second slightly elongate, the third to sixth short and closely sessile, the seventh ovate and slightly enlarged, its apex with a minute button. The palpi are at least as long as the antennae, four jointed; the first joint appearing double, mushroom shaped, its stem obconate, short pubescent, its head flattened, discoidal, pilose and provided with setae; *the second joint is spherical* and with a short pedicel; the third and fourth joints are elongate as in *Thalassomyia*. The tarsal claws of all the feet of the female, both claws of each hind foot, and the outer claws of the other feet of the male, simple; the inner claw of each fore and middle foot of the male is stouter, flattened, spoon shaped, and from the figure it appears as if the apical margin were scalloped; the empodium pectinate. The apex of the abdomen of the female is provided with a pair of jointed appendages; the basal joint of each is slender, the second short, obconate, the third disklike, thin, its plane vertical, oval in outline, its apical margin notched; male genitalia resembles that of *Thalassomyia fusca*. The form of the head, eyes, thorax, abdo-

men, legs, etc. like *Thalassomyia*. The fore metatarsus is shorter than its tibia, the fourth tarsal joint on all feet of both sexes obcordate, shorter than the fifth; apex of each tibia with two delicate setae; wing venation as in *Thalassomyia*, the surface under a low power, appears punctate, under high power, short haired.

The larvae were found upon the rocks among the algae at the seacoast, in the Bay of Saint Malo, Brittany. They are described as green in color, ten or twelve mm. in length. The labium has 14 teeth, the two median, larger than those adjacent; in other respects it does not appear to differ from *Thalassomyia fusca*. The eggs are oval, measuring 200 to 280 microns, and are deposited singly or in little groups, embedded in a jellylike substance.

The type species and the only one described, is *S. isemerimus* Chevrel. From Chevrel's description it will be seen that the female differs from *Thalassomyia fusca* and *congregata* in the form of the first and second palpal joint and in color characters. Whether it differs in any particular from *T. frauenfeldi* I am unable to say since Schiner's description does not mention the form of the palpal joints. The male differs from the male of *T. fusca* in the number of antennal joints, the form of the first two palpal joints and in the formation of the tarsal claws. The males of *T. congregata* and *frauenfeldi* have not been described as far as I am aware.

Genus 46. *Macroptilum* Becker

Mitteilungen d. Zool. Museum. Berlin No. 2. 2:77

Since the foregoing pages were written it was found that this genus, which was recently described by Becker, was overlooked. The type of the genus and the only described species is *Macroptilum nudum* Becker, from Egypt.

Errata

P. 142, line 14, for "puleripennis" read "pulchripennis."

ADDENDA

A number of larvae representing three species were taken by Mr. R. E. Richardson from the stomach of a shovel-nose sturgeon. The fish was caught June 1904 in the Mississippi river near Grafton, Illinois. All the specimens were in rather poor condition, but they nevertheless exhibit peculiar characters which prevent placing them in any of the foregoing genera. Two of them (A and B) are certainly members of the group *Chironomus*, and possibly belong to the genus *Tanytarsus*. The third one is a Chironomid having both *Chironomus* and *Ceratopogon* affinities.

Chironomus sp. A.

Length 7 mm. Body stout, greenish in color; head brown, small, only about half as wide as the thoracic segment, tapering; eyes each consisting of two small distinctly separated pigment spots,

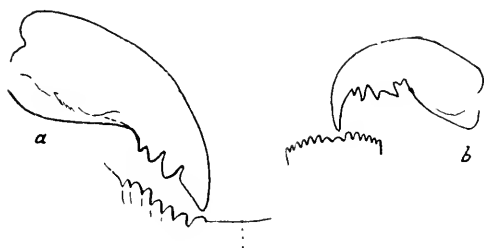


Fig. 18 Mandible and labium; larva A x400; larva B x180

situated as far cephalad as the margin of the labium. Anterior prolegs with rather numerous curved setae; posterior prolegs slender with a few bilobed pale brown claws. Antennae long, more than half the length of the head, three-jointed, besides the short basal prominence and two slender apical processes; first joint long, second very short, no longer than wide, third about $\frac{2}{3}$ as long as the first. Mandible stout, darkened apically, with moderately stout teeth; labium with margin concave (see figure). Teeth arranged on each side of the center line, the middle section toothless. There are four anal blood gills but there are none on the ventral surface of the eleventh segment; above the superior pair of anal gills are two stout setae; the dorso-caudal papillae are short, each with a tuft of long pale brown setae.

Chironomus sp. B.

Length 6.5 mm.; color greenish; head brown, rectangular, nearly as wide as the first thoracic segment; eyes as in species "A" described above; antennae long, about half as long as the head, three-jointed, not counting the basal prominence and the apical processes; the first and third joints about of equal length, the middle one about $\frac{2}{3}$ as long as the first. Mandible stout, black tipped, the teeth very prominent; labium rounded, teeth small, the first laterals shorter than the second (fig.18B). Fore prolegs with rather short spines; posterior prolegs not visible and probably destroyed. Caudal papillae and anal blood gills present, but not in sufficiently good condition to describe; ventral blood gills wanting.

Chironomid sp. C.

Length 9 mm. Body stout, green in color; head very small, slender and tapering, yellowish; mouth parts resembling those of *Ceratopogon*; mandibles small, slender, sharp, and apparently move in a nearly vertical plane. On the convex surface of the mandible is a slender spine. The antennae are long and slender, nearly as long as the head, the articulations indistinct, apex with slender processes. Eyes each consisting of a pair of pigment spots situated on the posterior fourth of the head. Margin of the labium apparently straight, toothless, not blackened, bounded on each side by the fan-shaped membrane which is present in *Chironomus*, the striations particularly distinct. Anterior prolegs prominent, with comparatively few, long, slender, curved, yellow, but not pectinate claws. These claws are not hairlike as in *Chironomus*, but more like the claws of the anterior prolegs of *Ceratopogon* sens. str. Posterior prolegs long and very slender, claws few in number and very small, very much smaller and shorter than those of the fore legs. Dorsal-caudal papillae with its setae and the anal blood gills present. The poor condition of the specimens renders further description impossible.

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EXPLANATION OF PLATES

PLATE 16

Chironomus sp.

- 1 Adult male. x6
- 2 Pupa
- 3 Head of adult female
- 4 Larva (the second and third segments coalescent)
- 5 Frontal aspect of larval head

PLATE 17

Ceratopogon sens. lat.

- 1 Larva. x6
- 2 Hypopharynx of larva. x100
- 3 Caudal end of larva. x100
- 4 *Ceratopogon* sens. str. Larva. x10
- 5 *Ceratopogon* sens. str. Body segment of larva. x40
- 6 *Ceratopogon* sens. str. Mandible of larva. x180
- 7 *Ceratopogon* sens. str. Thoracic prolegs of larva. x400
- 8 *Ceratopogon* sens. str. Claw of hind proleg of larva. x400
- 9 *Ceratopogon* sens. str. Dorsal aspect of pupa. x15
- 10 *Bezzia* sp. Dorsal aspect of labium, maxilla and its palpus
- 11 *Bezzia* sp. Ventral aspect of pupa
- 12 *Bezzia* sp. Thoracic respiratory organ of pupa. x100
- 13 *Brachypogon* wing
- 14 *Ceratopogon* sens. str., wing
- 15 *Bezzia* wing
- 16 *Sphaeromyas* wing

PLATE 18

Ceratopogon sens. lat.

- 1 Dorsal aspect of labrum of larva ; a, antenna ; b, papilla. x400
- 2 Dorsal aspect of labium and maxilla of larva ; p, palpus. x400
- 3 Lateral aspect of head of larva ; m, mandible ; a, antenna. x100

Bezzia setulosa

- 4 Mandible of larva. x400
- 5 Hypopharynx of larva. x400
- 6 Dorsal aspect of labium of larva. x400

Ceratopogon sens. str.

- 7 Foot of imago

Culicoides sp.

- 8 Foot of imago

Bezzia setulosa

- 9 Respiratory organ of pupa. x100
- 10 Dorsal aspect of pupa. x15
- 11 Ventral aspect of pupa. x15
- 12 Fore femur of imago. x40

Sphaeromyas argentatus

- 13 Fore fifth tarsal joint of female imago. x40
- 14 Hind fifth tarsal joint of female imago. x40

Bezzia setulosa

- 15 Antenna of male imago. x40
- 16 Antenna of female imago. x40

PLATE 19

Ablabesmyia flavifrons

- 1 Ventral aspect of head of larva: a, antenna; md, mandible; mx, maxilla; p, palpus; l, labium. x100
- 2 Respiratory organ of the pupa. x50

Procladius pinguis

- 3 Respiratory organ of pupa. x50
- 4 Caudal appendage of pupa. x15

Ablabesmyia sp.

- 5 Labium of larva. x180

Ablabesmyia dyari

- 6 Caudal appendage of pupa. x15
- 7 Respiratory organ of pupa. x50

Ablabesmyia monilis

- 8 Pupa. x5
- 9 Larva. x5

Procladius adumbratus

- 10 Caudal end of larva. x50

Ablabesmyia monilis

- 11 A pale claw of the posterior proleg of larva. x100
- 12 A dark claw of the posterior prolegs of larva. x100
- 13 Respiratory organ of pupa. x40
- 14 Ventral aspect of head of larva: a, antenna; md, mandible; mx, maxilla; p, palpus; l, labium; h, hypopharynx; x, lateral process. x100
- 15 Caudal appendage of pupa. x40

Ablabesmyia fastuosa

- 16 Mandible of larva. x100
- 17 Antenna of larva. x100
- 18 Respiratory organ of pupa. x40
- 19 Caudal appendage of pupa. x40

PLATE 20

Procladius adumbratus

- 1 Ventral aspect of head of larva: a, antenna; md, mandible; mx, maxilla; p, palpus; l, labium; h, hypopharynx; x, lateral process. x180
- 2 Slender claw of posterior proleg. x180
- 3 Stout claw of posterior proleg. x180
- 4 Caudal appendage of pupa. x40
- 5 Respiratory organ of pupa. x100

Ablabesmyia carnea

- 6 Ventral aspect of head of larva: a, antenna; md, mandible; mx, maxilla; p, palpus; l, labium; h, hypopharynx; x, lateral process. x180
- 7 Respiratory organ of pupa. x100
- 8 Caudal appendage of pupa. x40

Diamesa waltlii

- 9 Ventral aspect of the head: md, mandible; mx, maxilla; p, palpus; ulr, labrum; la, lateral arms; l, labium; hy, hypopharynx

Chironomus sens. lat. sp.

- 10 Dorsal aspect of head: ds, dorsal sclerite; a, antenna (wanting); b, frontal process

PLATE 21

Chironomus tenellus

- 1 Ventral aspect of head of larva: ulr, labrum; la, lateral arms; md, mandible; mx, maxilla; p, palpus; l, labium. x150
 2 Caudal end of pupa. x60
 3 Lateral aspect of the fifth abdominal segment of pupa. x60
 4 Antenna of larva. x150

Chironomus nigricans

- 5 Antenna of larva. x150
 6 Ventral aspect of head of larva: l, labium; hy, hypopharynx; mx, maxilla; imx, inner lobe of maxilla; p, palpus. x150
 7 Mandible of larva. x150
 8 Anterior prolegs of larva. x25
 9 Posterior end of larva. x25
 10 Epipharynx of larva: an, anterior comb; c, posterior comb. x250
 11 Dorsal aspect of second and third abdominal segments of pupa. x25
 12 Comb at caudal end of lateral fin of eighth segment of pupa. x60

Chironomus flavicingula

- 13 Ventral aspect of epipharynx of larva, distended: f, posterior comb; s, curved setae. x250
 14 Ventral aspect of labrum: a, epipharynx (shown enlarged in fig.13). x150
 15 Dorsal aspect of labrum. x250
 16 Dorsal aspect of third segment of pupa. x25
 17 Lateral fin of eighth segment of pupa. x60
 18 Labium of larva. x150
 19 Ventral aspect of mouth parts of larva: l, labium; mx, maxilla; p, palpus; hy, hypopharynx

PLATE 22

Chironomus flavus

- 1 Ventral aspect of head of larva: a, antenna; md, mandible; mx, maxilla; p, palpus; hy, hypopharynx; l, labium; f, fan-membrane. x150
 2 Caudal end of larva: a, caudal setae; b, blood gills. x35
 3 Lateral aspect of second and third abdominal segments of pupa. x35
 4 Spur of lateral fin of eighth segment of pupa. x60

Tanytarsus defleclus

- 6 Respiratory organ of pupa. x100

Chironomus sp. (81)

- 7 Ventral aspect of mouth parts, labium and maxilla. x100

Chironomus modestus

- 8 Eighth segment and anal appendage of pupa. x50
- 9 Antenna of larva. x100
- 10 Labrum, ventral aspect: la, lateral arms. x100
- 11 Ventral aspect: l, labrum; md, mandible; mx, maxilla; p, palpus; f, fan-like membrane. x100
- 12 Dorsal aspect of fourth abdominal segment of pupa. x50

Tanytarsus sp.

- 13 Dorsal aspect of fourth abdominal segment. x40

Chironomus modestus var. b.

- 14 Dorsal aspect of posterior part of abdomen of pupa. x40

Chironomus modestus var. a.

- 15 Dorsal aspect of fourth segment of abdomen of pupa. x50
- 16 Lateral fin of the eighth abdominal segment of pupa. x50

Tanytarsus sp.

- 17 Lateral fin of the eighth abdominal segment of pupa. x40
- 18 Spur of the lateral fin; possibly of another species. x100

Chironomus fulviventris

- 19 Posterior comb of the epipharynx of the larva. x100

Chironomus (?) fulvus

- 20 Dorsal aspect of abdominal segment of pupa. x50

Chironomus sp. (84)

- 21 Labium of larva. x100

Chironomus sp. (82)

- 22 Labium of larva. x180

Chironomus (?) fulvus

- 23 Lateral fin of the eighth segment of pupa. x50

Chironomus fulviventris

- 24 Labium of larva. x100
- 25 Antenna of larva. x100
- 26 Lateral fin of the eighth abdominal segment of pupa. x100

PLATE 23**Chironomus dorsalis**

- 1 Labium of larva (after Miall and Hammond, 1900). x100

Chironomus lobiferus

- 2 Antenna of larva. x100
- 3 Ventral aspect of larval head: l, labium; mx, maxilla; p, palpus; f, fan-like membrane. x100
- 4 Lobe of an abdominal segment of the imago. x100
- 5 Comb of the lateral fin of the eighth segment of the pupa. x400

Chironomus sp. (83)

- 6 Labium of larva. x180

Chironomus decorus

- 7 Mandible of larva. x150
- 8 Labium of larva. x100
- 9 Pupa. x6
- 10 Ventral aspect of labrum of larva: an, anterior comb; c, posterior comb; lr, lateral arm. x150
- 11 Dorsal aspect of second abdominal segment of pupa. x40
- 12 Anal end of pupa. x40
- 13 Labium of larva (of another variety or possibly species). x180

Chironomus (?) plumosus

- 14 Spur of the lateral fin of eighth segment of pupa. x100
- 15 Labium of larva. x180
- 16 Maxilla of larva: p, palpus. x180

PLATE 24

Cricotopus exilis

- 1 Ventral aspect of mouth parts of larva: l, labium; mx, maxilla; p, palpus; hy, hypopharynx. x250
- 2 Ventral aspect of the labrum. x250
- 3 Caudal end of pupa. x60
- 4 Mandible of larva. x250

Cricotopus trifasciatus

- 5 Ventral aspect of mouth parts of larva, labium and maxilla. x150
- 6 Mandible of larva. x150
- 7 Lateral aspect of abdominal segments of pupa. x35
- 8 Respiratory organ of pupa. x150
- 9 Lateral hair-tuft of larva. x150
- 10 Caudal end of pupa with the caudal end of enclosed imago. x35

Orthocladius flavus

- 11 Hypopharynx of larva. x80
- 12 Ventral aspect of mouth parts of larva: a, antenna; md, mandible; mx, maxilla; p, palpus; l, labium. x80
- 13 Respiratory organ of pupa. x60
- 14 Ventral aspect of labrum of larva: la, lateral arm. x250
- 15 Lateral aspect of the posterior end of the seventh abdominal segment of the pupa
- 16 Caudal end of pupa. x25
- 17 Larval case, natural size

Orthocladius nivoriundus

- 18 Ventral aspect of labrum of larva: la, lateral arm. x150
- 19 Antenna of larva. x150
- 20 Mandible of larva. x150
- 21 Ventral aspect of mouth parts of larva: l, labium; mx, maxilla; hy, hypopharynx. x150
- 22 Dorsal aspect of abdominal segment of pupa. x80
- 23 Respiratory organ of pupa. x60
- 24 Caudal appendage of pupa. x35

PLATE 25

Orthocladius fugax

- 1 Mandible of larva. x150
- 2 Ventral aspect of mouth parts of larva: l, labium; mx, maxilla; p, palpus; hy, hypopharynx
- 3 Latero-ventral aspect of labrum of larva: a, antenna; ep, epipharynx; c, lateral arm. x150
- 4 Respiratory organ of pupa. x150
- 5 A pectinate hair from anterior prolegs of larva. x400
- 6 Caudal end of larva. x60
- 7 Lateral aspect of second, third and fourth abdominal segments of pupa. x60
- 8 Claw of posterior proleg of larva. x250
- 9 Peripheral claw of posterior proleg of larva. x250
- 11 Dorsal aspect of fifth abdominal segment of pupa

Orthocladius sordidellus

- 12 Ventral aspect of labrum of larva. x180
- 13 Antenna of larva. x180
- 14 Ventral aspect of mouth parts of larva: l, labium; md, mandible; mx, maxilla; p, palpus; lr, labrum. x250
- 15 Lateral aspect of abdominal segment of pupa. x150

Tanytarsus dissimilis

- 16 Ventral aspect of mouth parts of larva: l, labium; md, mandible; mx, maxilla; p, palpus; lr, labrum. x250
- 17 Antenna of larva. x250
- 18 Dorsal aspect of abdomen of pupa of variety a. x60
- 19 Comb of the lateral fin of the eighth segment of pupa. x250
- 20 Dorsal aspect of the abdomen of pupa. x60
- 21 Comb of lateral fin of eighth segment of pupa. x250

Cricotopus varipes

- 22 Ventral aspect of mouth parts of larva: l, labium; mx, maxilla; p, palpus

PLATE 26

Tanytarsus dives

- 1 Dorsal aspect of head of larva: a, antenna; lr, labrum. x60
- 2 Apical end of mandible of larva. x150
- 3 Respiratory organ of pupa. x60
- 4 Ventral aspect of mouth parts of larva: l, labium; mx, maxilla; p, palpus; imx, inner lobe of maxilla; hy, hypopharynx. x250
- 5 Caudal end of larva. x25
- 6 Caudal end of pupa. x25
- 7 Dorsal aspect of abdominal segments of pupa. x25

Tanytarsus exiguus

- 8 Larva. x20
- 9 Fibrous case of larva and pupa. x6
- 11 Dorsal aspect of second abdominal segment of pupa. x100
- 12 Ventral aspect of mouth parts of larva: l, labium; md, mandible; mx, maxilla; p, palpus. x400

- 13 Antenna of larva. x250
- 14 Latero-ventral aspect of head of larva: a, antenna; md, mandible; mx, maxilla; l, labium
- 15 Caudal end of pupa (male). x100

PLATE 27

- 1 *Procladius pusillus*
- 2 *Procladius caliginosus*
- 3 *Procladius pinguis*
- 4 *Procladius scapularis*
- 5 *Ablabesmyia carnea* var. c.
- 6 *Ablabesmyia monilis*
- 7 *Tanypus stellatus*
- 8 *Ablabesmyia venusta*
- 9 *Ablabesmyia dyari*
- 10 *Ablabesmyia melanops*
- 11 *Ablabesmyia flavifrons*
- 12 *Ablabesmyia indecisa*
- 13 *Ablabesmyia indecisa* (after Williston)
- 14 *Ablabesmyia pallens*, var. a.
- 15 *Tanypus culiciformis*
- 16 *Chasmatonotus bimaeculatus*

PLATE 28

- 1 *Chironomus brachialis*
- 2 *Chironomus scalaenus*
- 3 *Chironomus spilopterus* (after Williston)
- 4 *Chironomus taeniapennis*
- 5 *Chironomus caliginosus*
- 6 *Chironomus flavicingula*
- 7 *Chironomus halteralis*
- 8 *Chironomus fallax*
- 9 *Chironomus riparius*
- 10 *Chironomus barbipes*
- 11 *Chironomus annularis*
- 12 *Chironomus albimanus* (male)
- 13 *Chironomus albimanus* (female)
- 14 *Chironomus devinctus*
- 15 *Chironomus nigricans*
- 16 *Chironomus pedellus*
- 17 *Chironomus aberrans*
- 18 *Chironomus fumidus*
- 19 *Chironomus fulvus*
- 20 *Chironomus flavus*

PLATE 29

- 1 *Chironomus modestus* var. a. female
- 2 *Chironomus modestus* var. a. female
- 3 *Chironomus modestus* var. b. male
- 4 *Chironomus modestus* female
- 5 *Chironomus pallidus*

- 6 *Chironomus fulviventris*
- 7 *Chironomus frequens*
- 8 *Chironomus dux*
- 9 *Chironomus viridicollis*
- 10 *Chironomus longimanus* (after Williston)
- 11 *Chironomus plumosus*
- 12 *Chironomus decorus*
- 13 *Chironomus similis*
- 14 *Chironomus cristatus*
- 15 *Cricotopus trifasciatus*
- 16 *Cricotopus exilis*
- 17 *Cricotopus bicinctus*
- 18 *Cricotopus varipes*
- 19 *Cricotopus sylvestris*
- 20 *Cricotopus debilis* (after Williston)

PLATE 30

- 1 *Camptocladius* sp.
- 2 *Camptocladius fumosus*
- 3 *Camptocladius byssinus*
- 4 *Camptocladius minimus*
- 5 *Orthocladius sordens*
- 6 *Orthocladius flavus*
- 7 *Orthocladius sordidellus*
- 8 *Orthocladius nivoriundus*
- 9 *Orthocladius absurdus*
- 10 *Orthocladius fugax*
- 11 *Orthocladius obumbratus*
- 12 *Thalassomyia fusca*
- 13 *Diamesa waltlii*
- 14 *Tanytarsus obediens*
- 15 *Tanytarsus gmundensis*
- 16 *Tanytarsus defleclus*
- 17 *Tanytarsus dives*
- 18 *Tanytarsus fatigans*
- 19 *Tanytarsus fulvescens*
- 20 *Tanytarsus muticus*
- 21 *Tanytarsus flavellus*

PLATE 31

- 1 *Metrioenemus flavifrons*
- 2 *Metrioenemus par*
- 3 *Metrioenemus lundbeckii*
- 4 *Metrioenemus exagitans*
- 5 *Metrioenemus atratulus*
- 6 *Chasmatonotus himaculatus* (head of male)
- 7 *Diamesa waltlii* (antenna of female)
- 8 *Orthocladius absurdus* (antenna of female)
- 9 A part of an egg string of *Sphaeromyas argentatus*
- 10 An egg mass of *Chironomus* sp. x2

- 11 An egg mass of *Tanypus* sp. (after Miall)
- 12 A part of an egg string of *Chironomus* sp.
- 13-14 A part of the egg string of *Chironomus dorsalis* (after Miall and Hammond)
- 15 A part of an egg string of *Chironomus* sp.
- 16 Dorsal aspect of thorax of a male *Chasmatonotus bimaculatus*. x40

PLATE 32

Genitalia: d, dorsal keel; l, lateral; s, superior; i, inferior lobe

- 1 *Bezzia setulosa*. Dorsal aspect. Male. x100
- 2 *Tanypus culiciformis*. Male. x100
- 3 *Ablabesmyia monilis*. Male. x100
- 4 *Corynoneura celeripes* (after Kieffer)
- 5 *Diamesa praeceox* (after Kieffer)
- 6 *Chasmatonotus bimaculatus*. Dorsal aspect. Male. x50
- 7 *Chironomus flavicingula*. Dorsal aspect. Male. x100
- 8 *Chironomus modestus*. Dorsal aspect. Male. x100
- 9 *Chironomus modestus* var. b. Latero-ventral aspect. Male. x100
- 10 *Chironomus fulviventris*. Male. x100
- 11 *Chironomus modestus*. Female. x100
- 12 *Chironomus flavus*. Ventral aspect. Male. x100
- 13 *Chironomus decorus*. Dorsal aspect. Male. x100
- 14 *Diamesa waitlii*. Dorsal aspect. Male. x50

PLATE 33

Genitalia: d, dorsal keel; l, lateral lobe; s, superior lobe; i, inferior lobe; a, appendage of the superior lobe

- 1 *Orthocladius kervilli* (after Kieffer)
- 2 *Cricotopus exilis*. Male. x100
- 3 *Tanytarsus dissimilis*. Ventral aspect. Male. x150
- 4 *Tanytarsus exiguus*. Ventral aspect. Male. x350
- 4a *Tanytarsus exiguus*. Male. Latero-ventral aspect. x100
- 5 *Tanytarsus dives*. Male. Dorsal aspect. x100
- 6 *Metriocnemus* par. Male. Lateral aspect. x100
- 7 *Orthocladius absurdus*. Lateral aspect. Female. x100
- 8 *Metriocnemus atratulus* (after Kieffer)

PLATE 34

Compontia cruciformis (= *Thalassomyia frauenfeldii*?)

- 1 Dorsal aspect of larva (after Theobald, 1892)

Hydrobaenus lugubris (after Fries)

- 2 Dorsal aspect of head of larva
- 3 Anterior prolegs of larva
- 4 Lateral aspect of larva
- 5 Lateral aspect of pupa
- 6 Antenna of female
- 7 Antenna of male
- 8 Caudal appendage of pupa
- 9 Wing of imago
- 10 Male genitalia
- 11 Lateral aspect of male clasper

Telmatogeton St Pauli (after Schiner)

- 12 Lateral aspect of larva.
- 13 Anterior prolegs of larva
- 14 Lateral aspect of pupa
- 15 Caudal sucker of pupa
- 16 Wing of imago

Orthocladius ? oceanicus (after Packard)

- 17 Ventral aspect of larval head
- 18 Posterior prolegs of larva
- 19 Anterior proleg of larva

Wulpiella scirpi (after Kieffer)

- 20 Wing of imago
- 21 Dorsal aspect of larva
- 22 Anterior proleg of larva
- 23 Ventral aspect of head of larva

Eurycnemus sp.

- 24 Lateral aspect of male (after Van der Wulp.)

PLATE 35**Macropeza**

- 1 Anterior part of wing of imago (after V. d. Wulp)
- 2 Wing of imago (after Meigen)
- 3 Antenna of imago (after Meigen)

Psamathomyia pectinata (after Deby)

- 4 Wing of male
- 5 Wing of female
- 6 Antenna
- 7 Haltere of male
- 8 Leg of male
- 9 Dorsal aspect of head and thorax

Tersesthes torrens (after Townsend)

- 10 Wing of imago
- 12 Palp of imago
- 13 Antenna of imago

Leptoconops (after Skuse)

- 14 Wing of adult

Eretmoptera (after Kellogg)

- 15 Foot of imago
- 16 Palp of imago
- 17 Labium of imago
- 18 Hypopharynx of imago
- 19 Labium-epipharynx of imago
- 20 Haltere of imago
- 21 Dorsal aspect of the male
- 22 Antenna of male
- 23 Antenna of female
- 24 Male genitalia

Didymorphleps (after Weyenbergh)

- 25 Wing of imago

Burmeisteria (after Weyenbergh)

- 26 Wing of imago
- 27 Lateral aspect of head and thorax of male
- 28 Haltere

Stenoxenus (after Coquillett)

- 29 Wing of female

PLATE 36

Corynoneura lemnae (after Fraenkenfeld)

- 1 Lateral aspect of larva
- 2 Anterior prolegs of larva
- 3 Posterior prolegs of larva
- 4 Caudal end of pupa
- 5 Lateral aspect of pupa

Corynoneura sp. (after Winnertz)

- 6 Hind leg of imago
- 7 Wing of imago
- 8 Palpus of imago
- 9 Antenna of male
- 10 Antenna of female

Clunio marinus

- 11 Lateral aspect of larva (after Carpenter)
- 12 Dorsal aspect of male (after Theobald)
- 13 Dorsal aspect of female (after Carpenter)

Diamesa culicoides (after Heeger except fig.14)

- 14 Lateral aspect of larva (after Braner)
- 15 Dorsal aspect of larva
- 16 Ventral aspect of pupa
- 17 Lateral aspect of pupa
- 18 Mandible of larva
- 19 Labium of larva
- 20 Maxilla of larva
- 21 Labrum of larva
- 22 Antenna of larva
- 23 "Underlip" (i. e. hypopharynx) of larva
- 24 Claw of hind foot of larva
- 25 Anterior proleg of larva

Doloplastus (after Skuse)

- 26 Wing of imago

PLATE 37

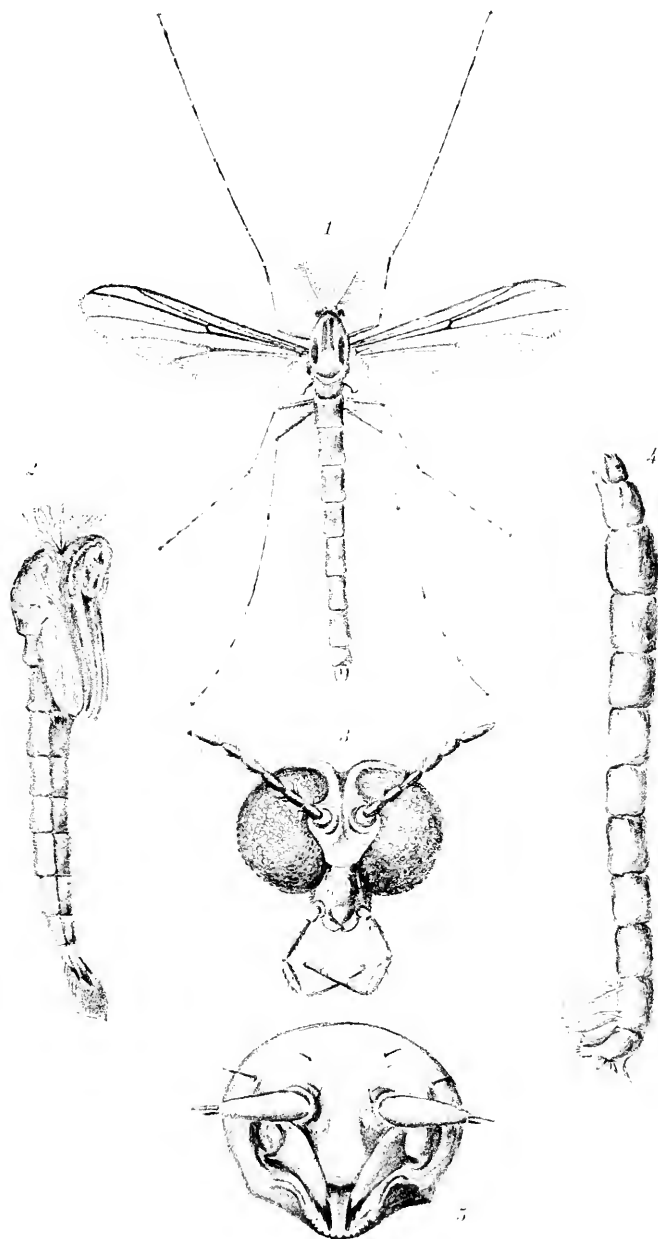
Limnophyes (after Verrall)

- 1 Dorsal aspect of female
- 2 Mouth parts of female
- 3 Antenna
- 4 Lateral aspect of head and thorax

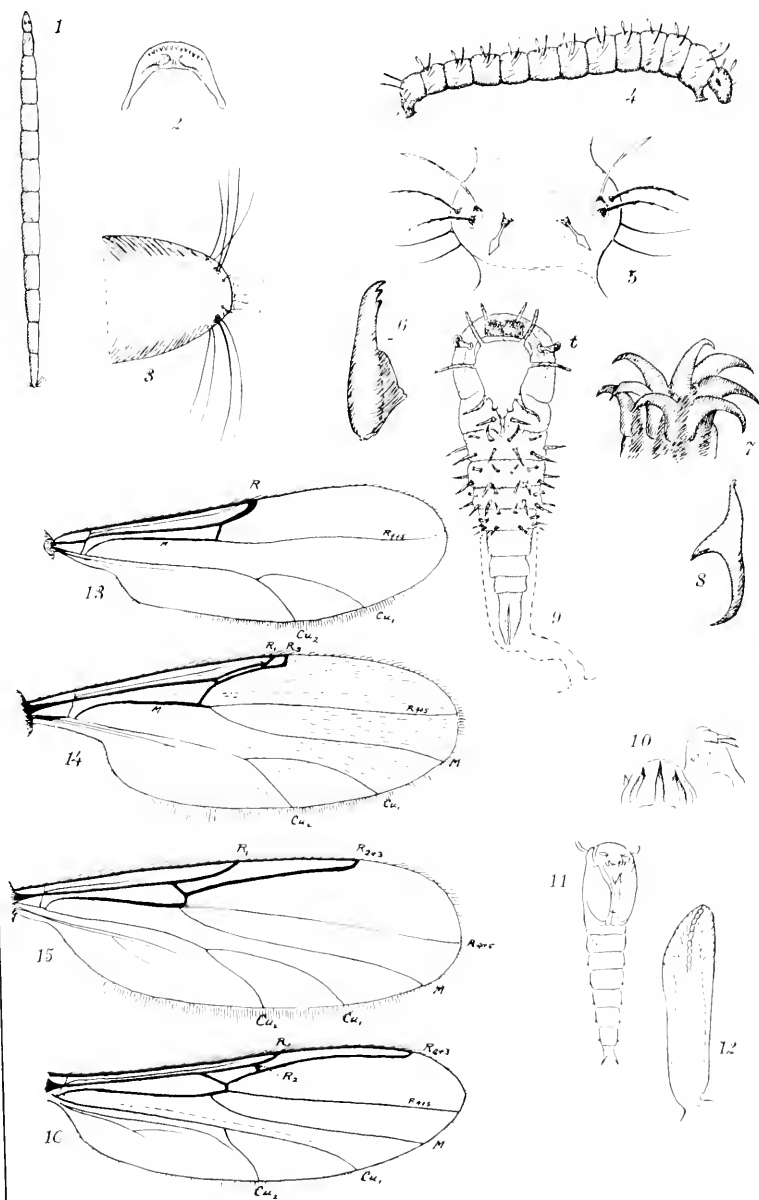
Halirytus (after Verrall)

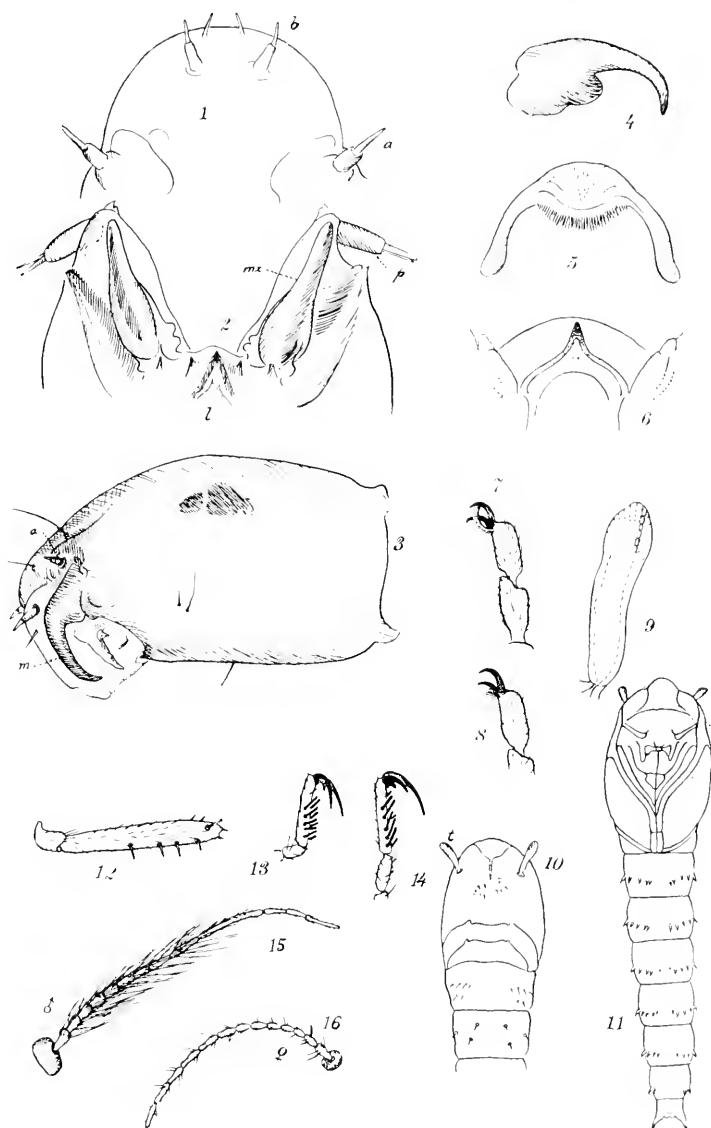
- 5 Fore leg of female
- 6 Lateral aspect of female
- 7 Antenna of female

- 8 Wing of imago **Heteromyia** (after Say)
- 9 Fore leg of imago
- 10 Antenna **Podonomus** (after Philippi)
- 11 Wing of imago
- 12 Wing of imago **Procladius** (after Skuse)
- 13 Wing of adult **Spaniotoma** (after Philippi)
- 14 Antenna
- 15 Wing of imago **Isoplastus** (after Skuse)
- 16 Wing of imago **Pentaneura** (after Philippi)
- 17 Wing of imago **Ablabesmyia pulchripennis** (after Lundbeck)
- 18 Wing of imago **Tetrphora** (after Philippi)
- 19 Antenna of imago
- 20 Wing of imago **Tanypus posticalis** (after Lundbeck)
- 21 Wing of imago **Heptagyia** (after Philippi)
- 22 Antenna of imago
- 23 Palpus of imago
- 24 Wing of imago **Procladius nervosus** (after V. d. Wulp)
- 25 Labium of larva (after Hammond) **Chironomus prasinus**
- 26 Labium of larva (after Osborn) **Chironomus** sp.
- 27 Labium of larva **Chironomus tentans** (after Weyenbergh)
- 28 Apex of mandible of larva

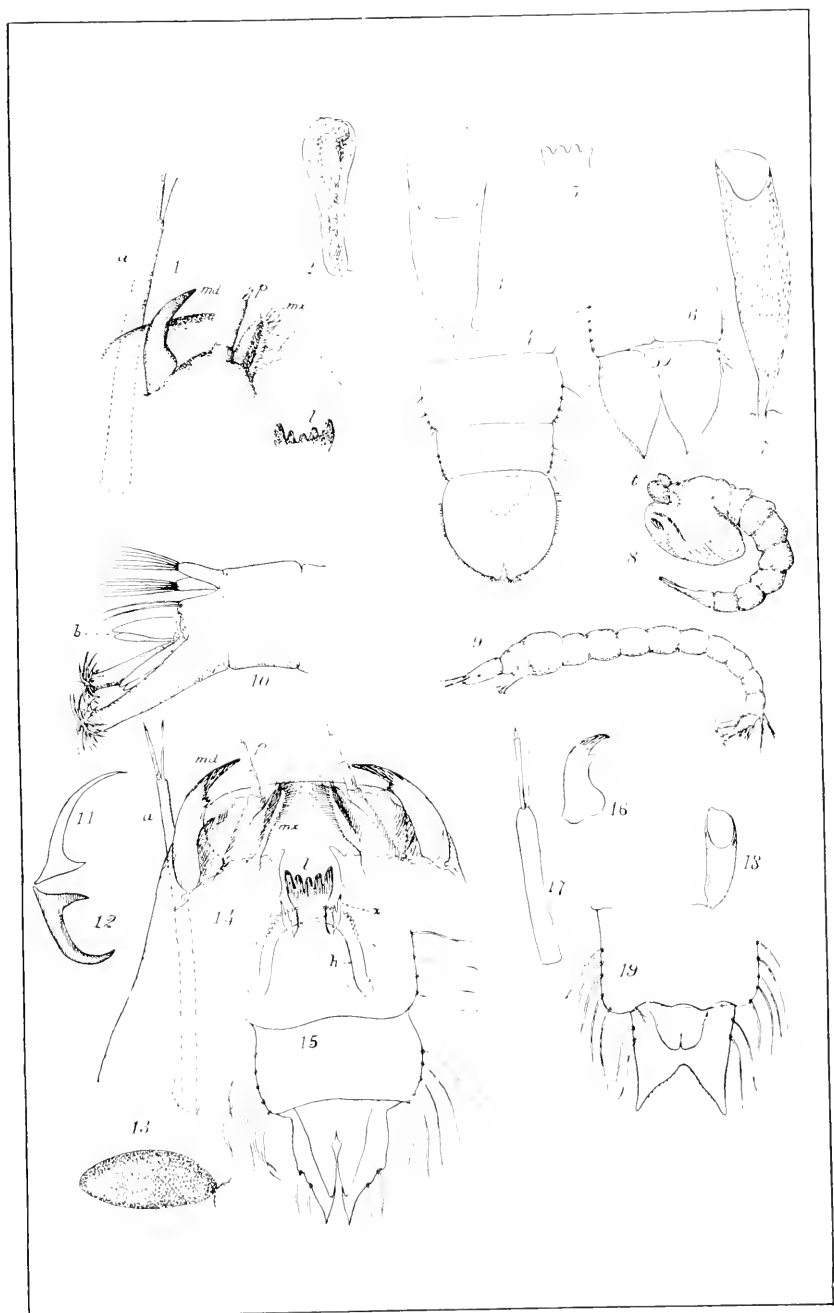


Chironomus

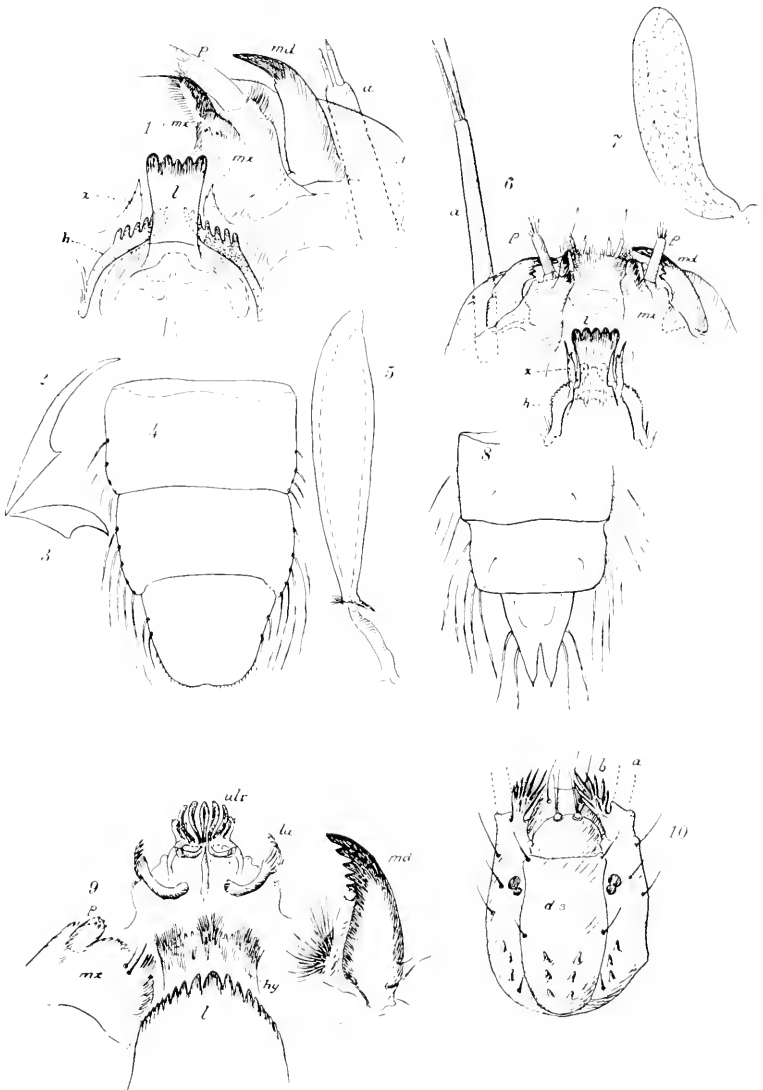


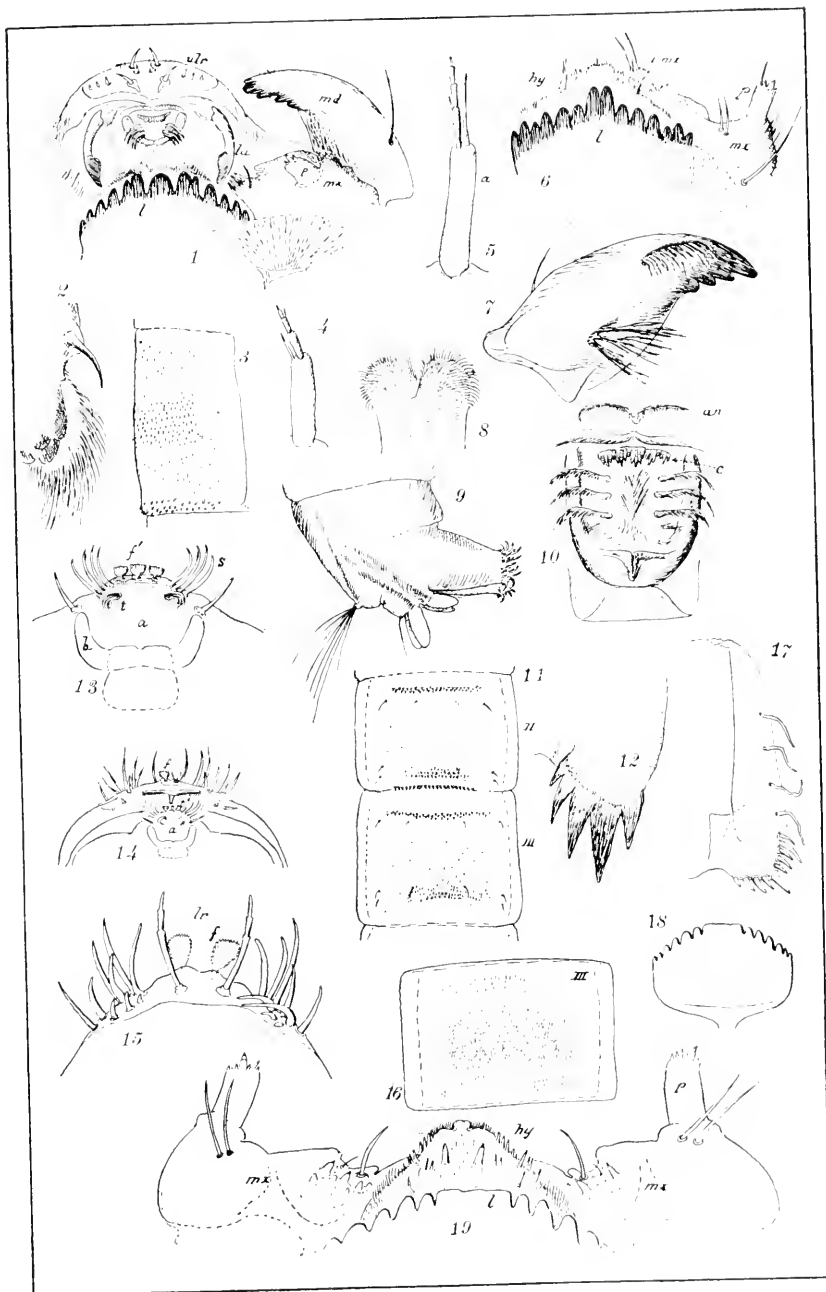


Ceratopogon group



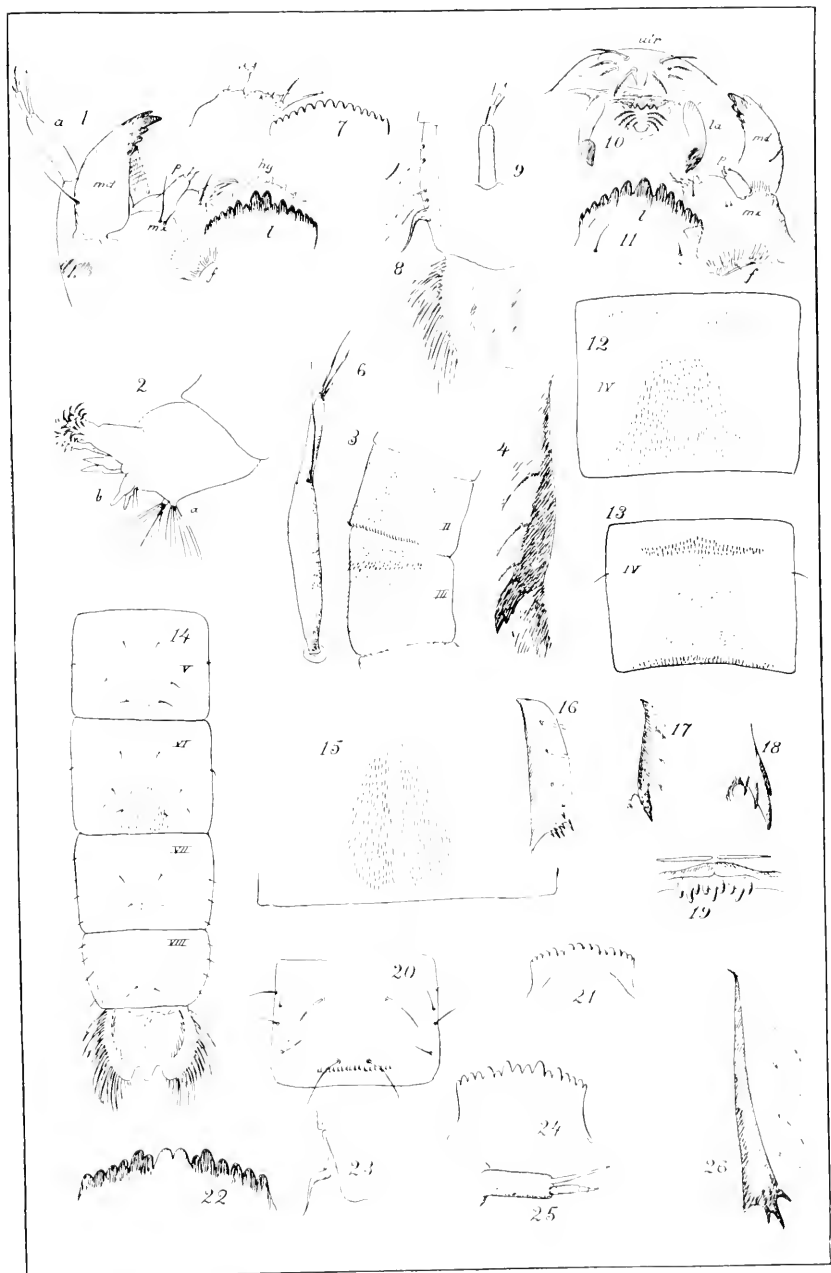
Tanypus group



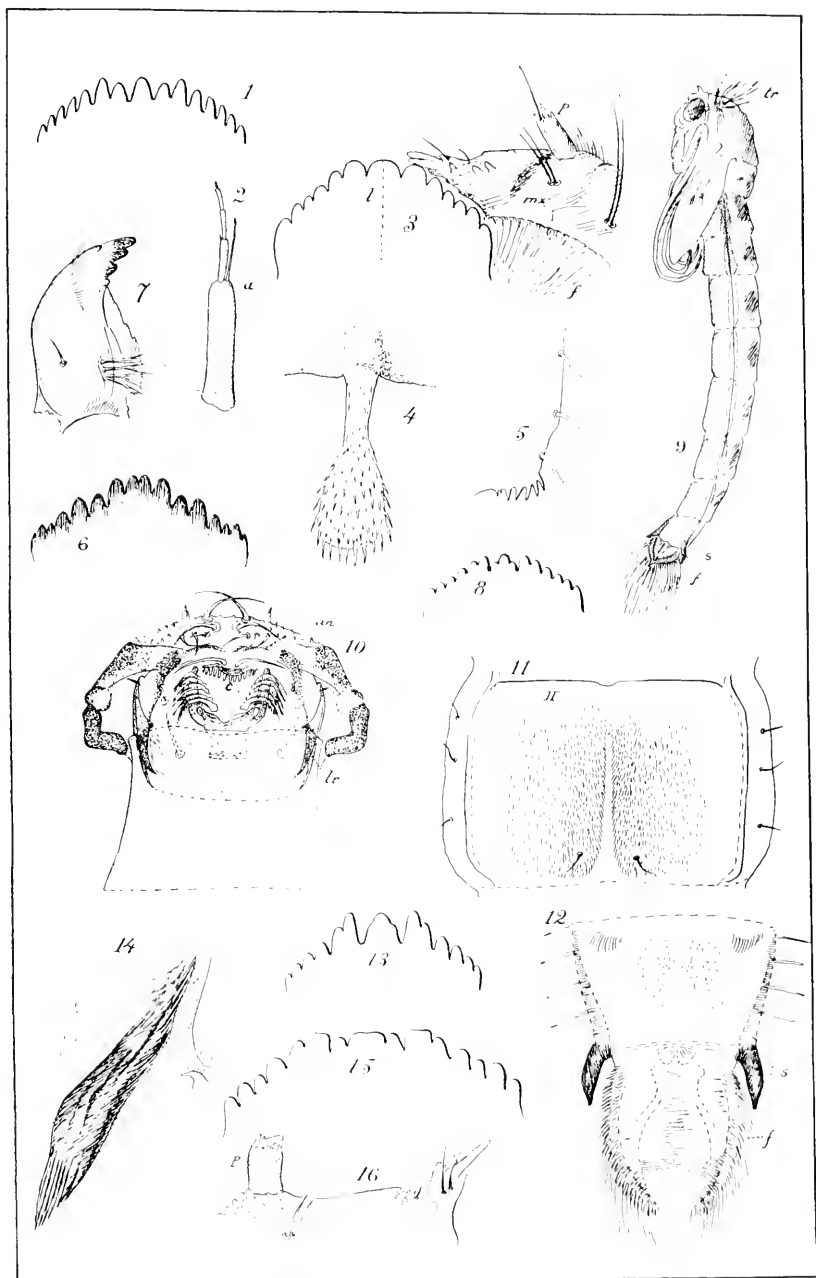


Chironomus: details of larva and pupa

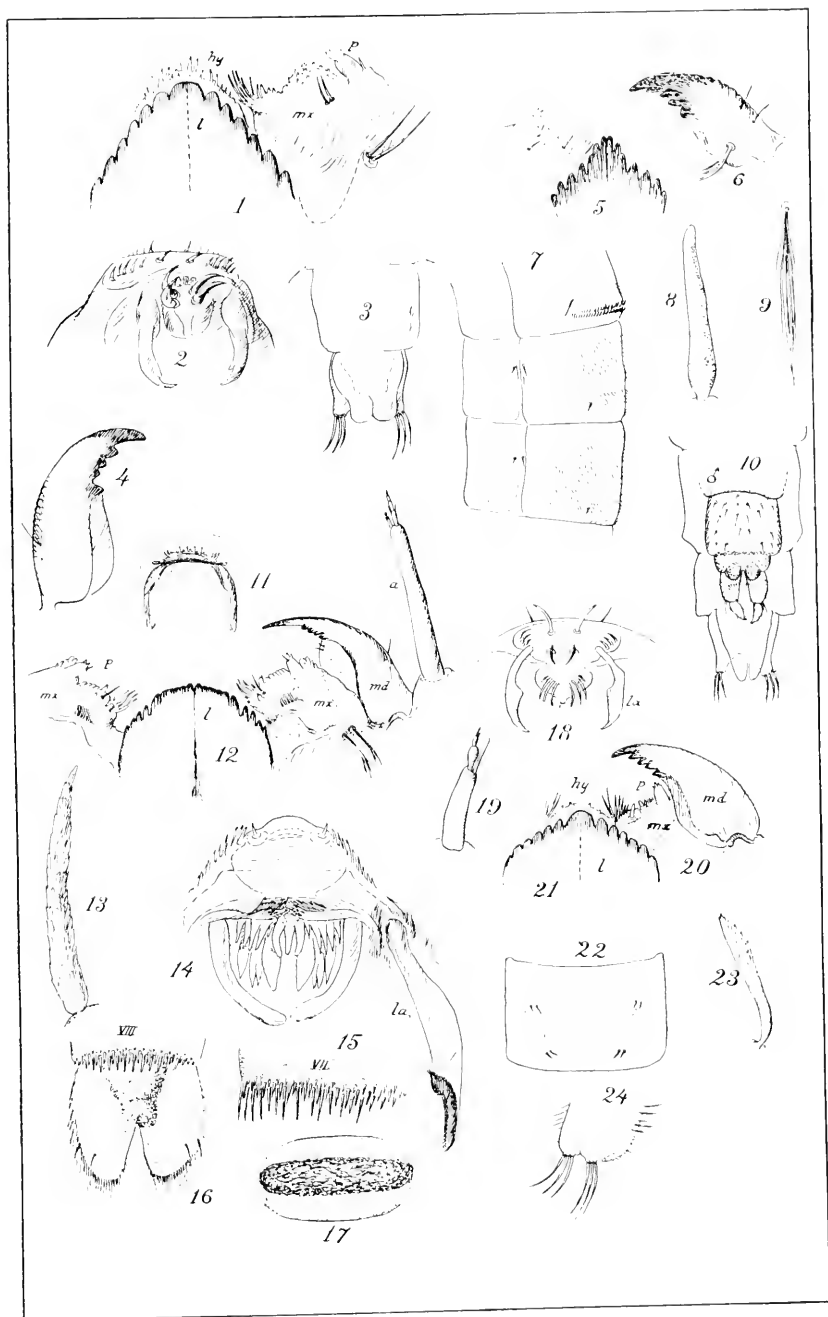
Plate 22



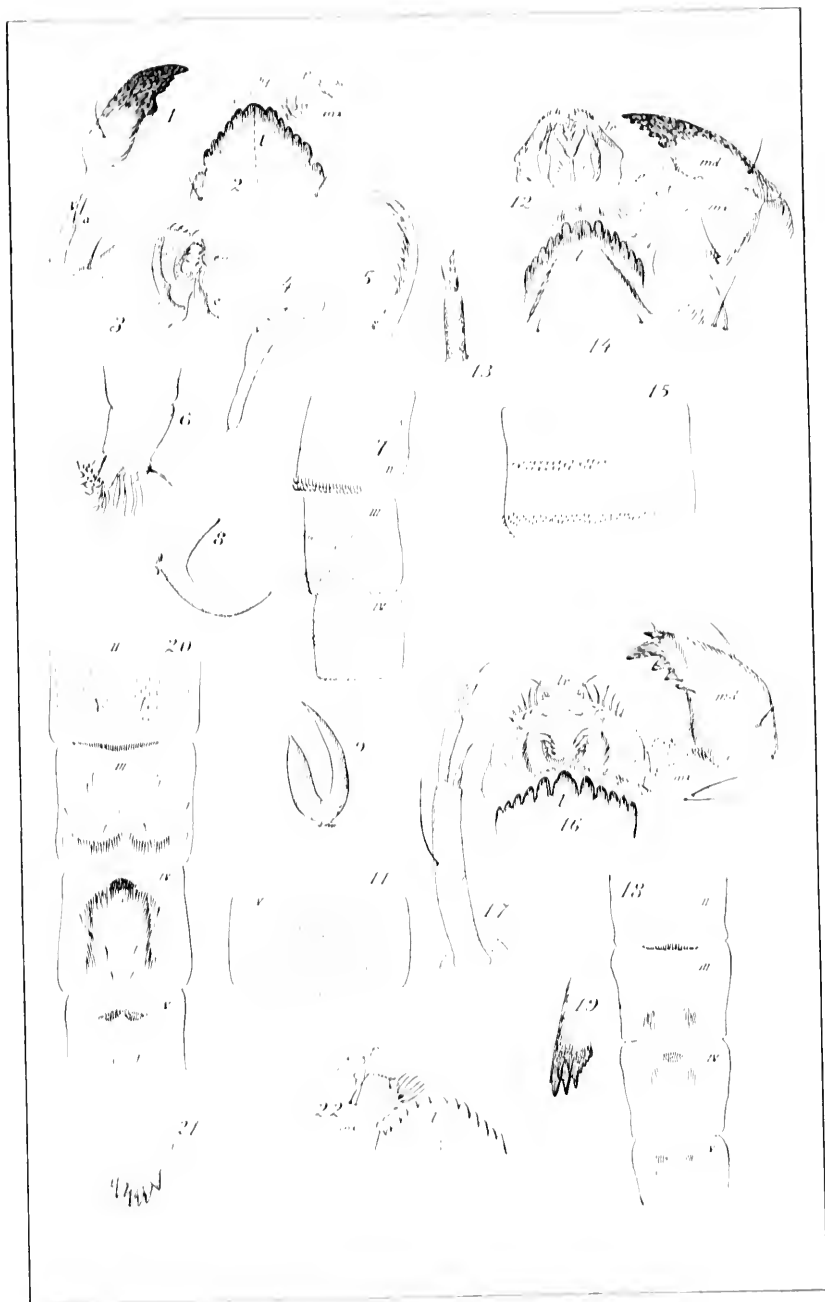
Chironomus: details of larva and pupa



Chironomus: details of larva and pupa



Cricetopus and *Orthocladius*



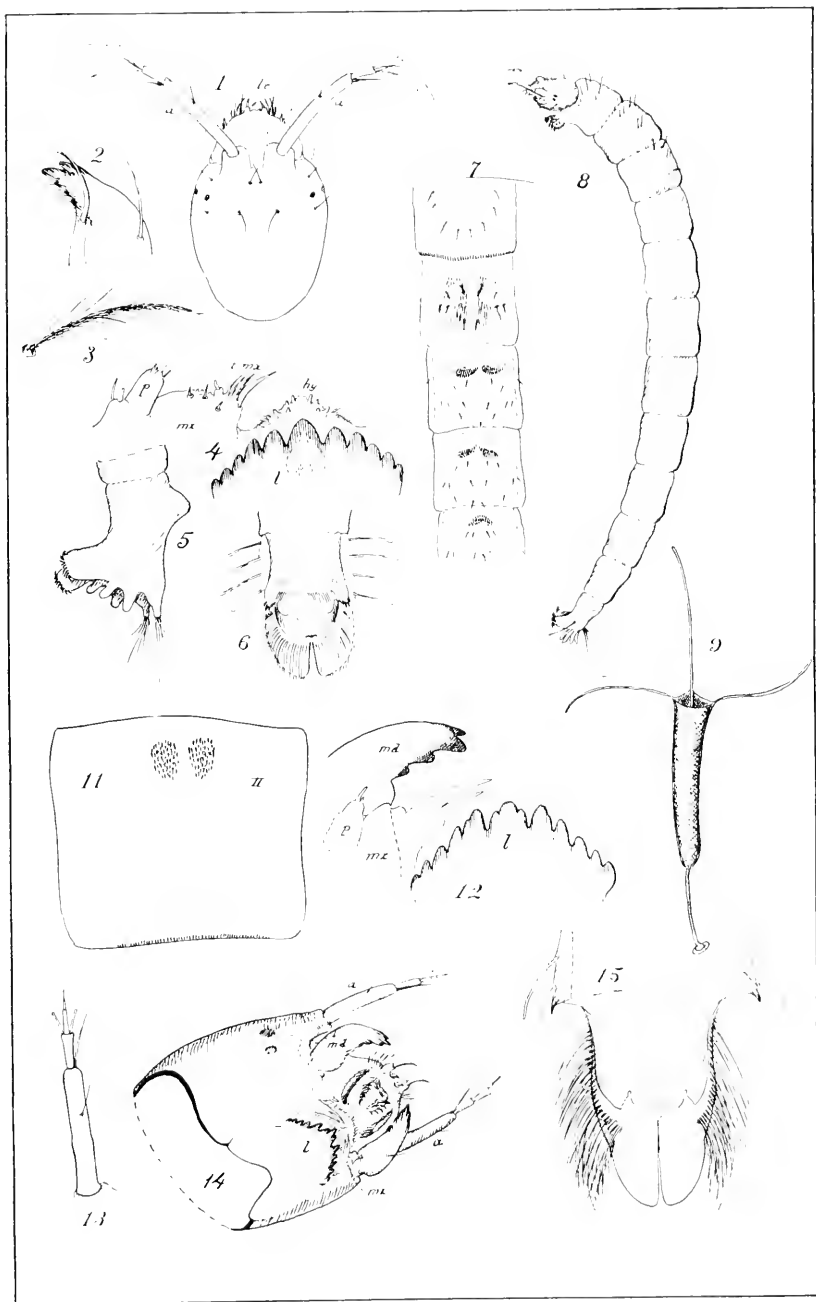
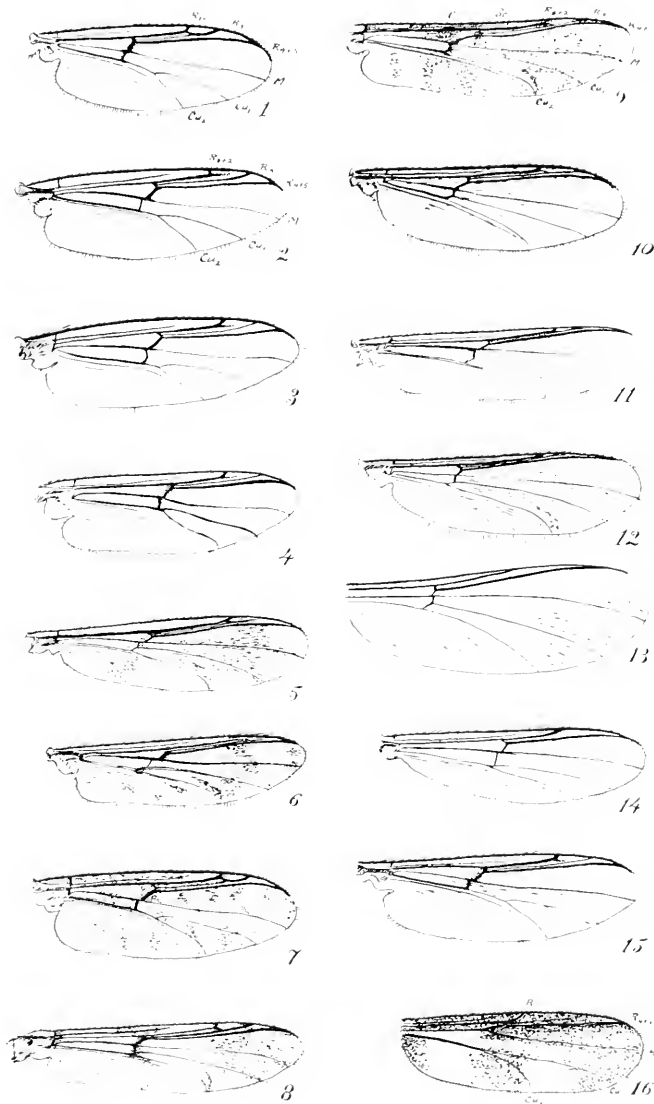
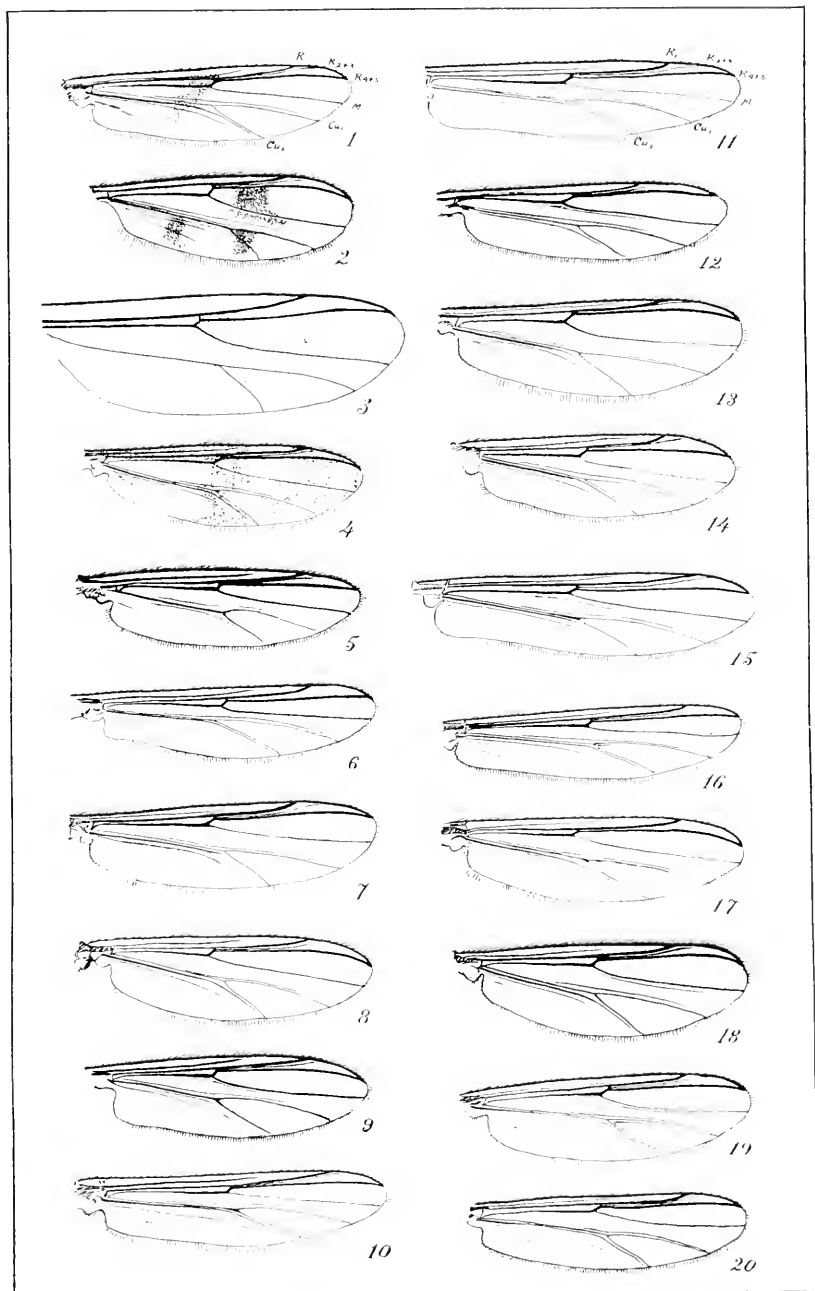


Plate 27



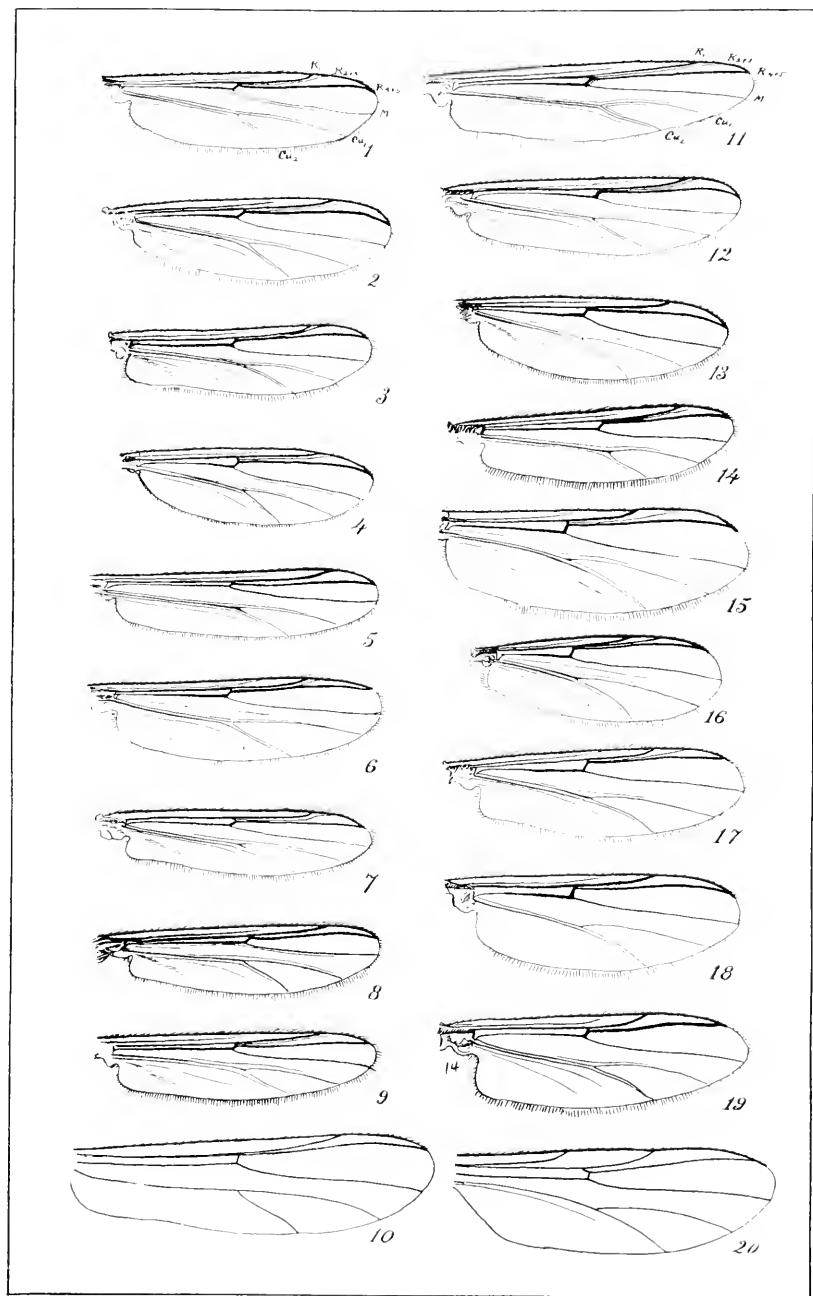
Tanypus group and Chasmatonotus

Plate 28

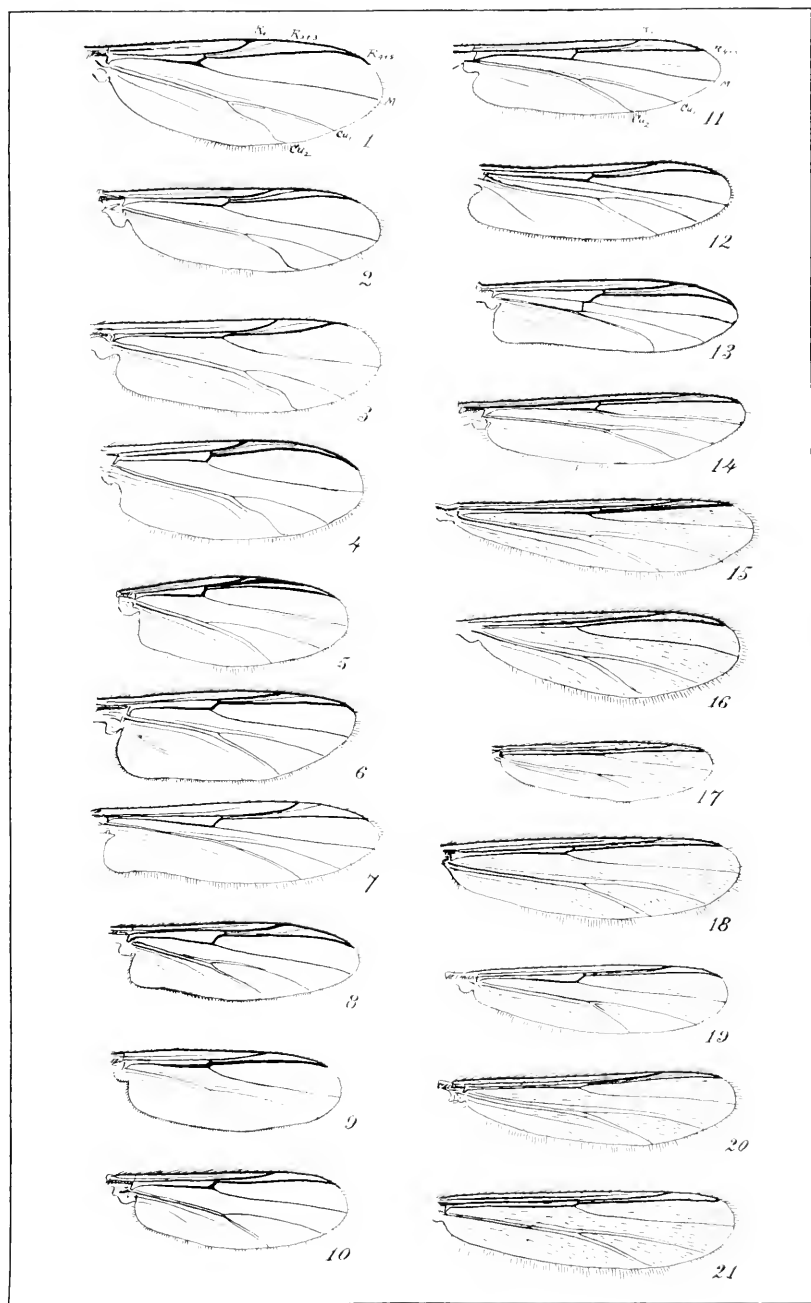


Chironomus

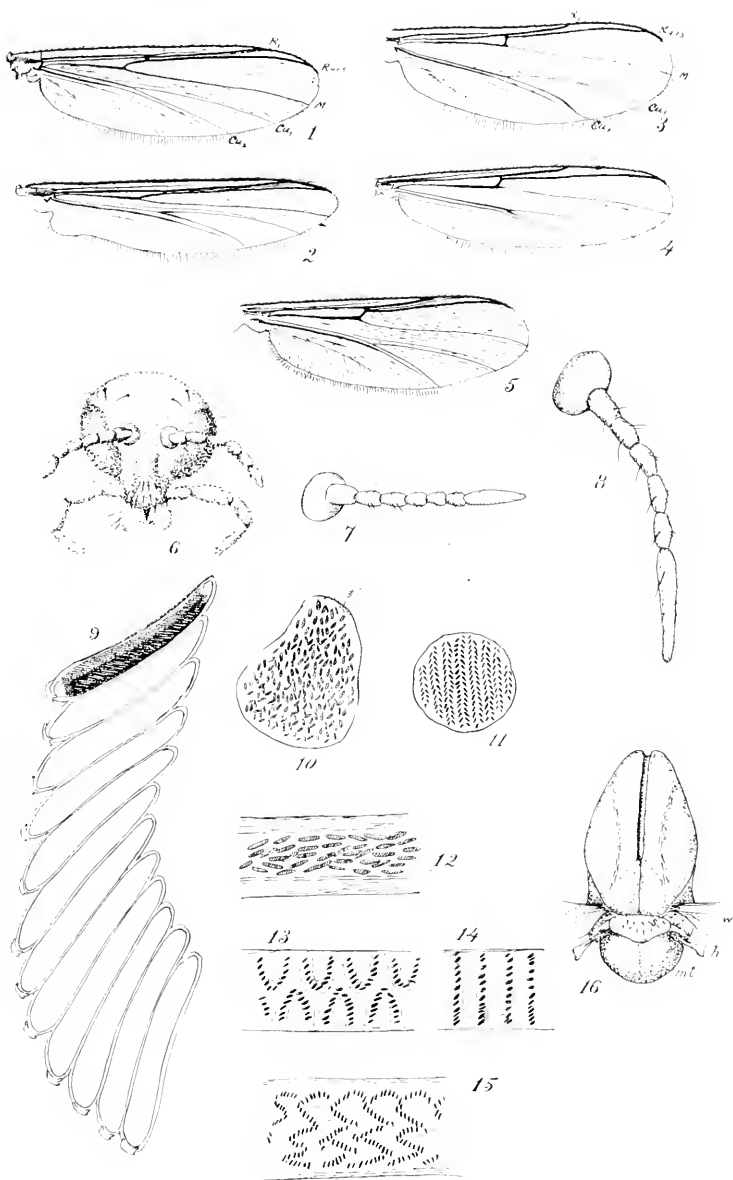
Plate 29



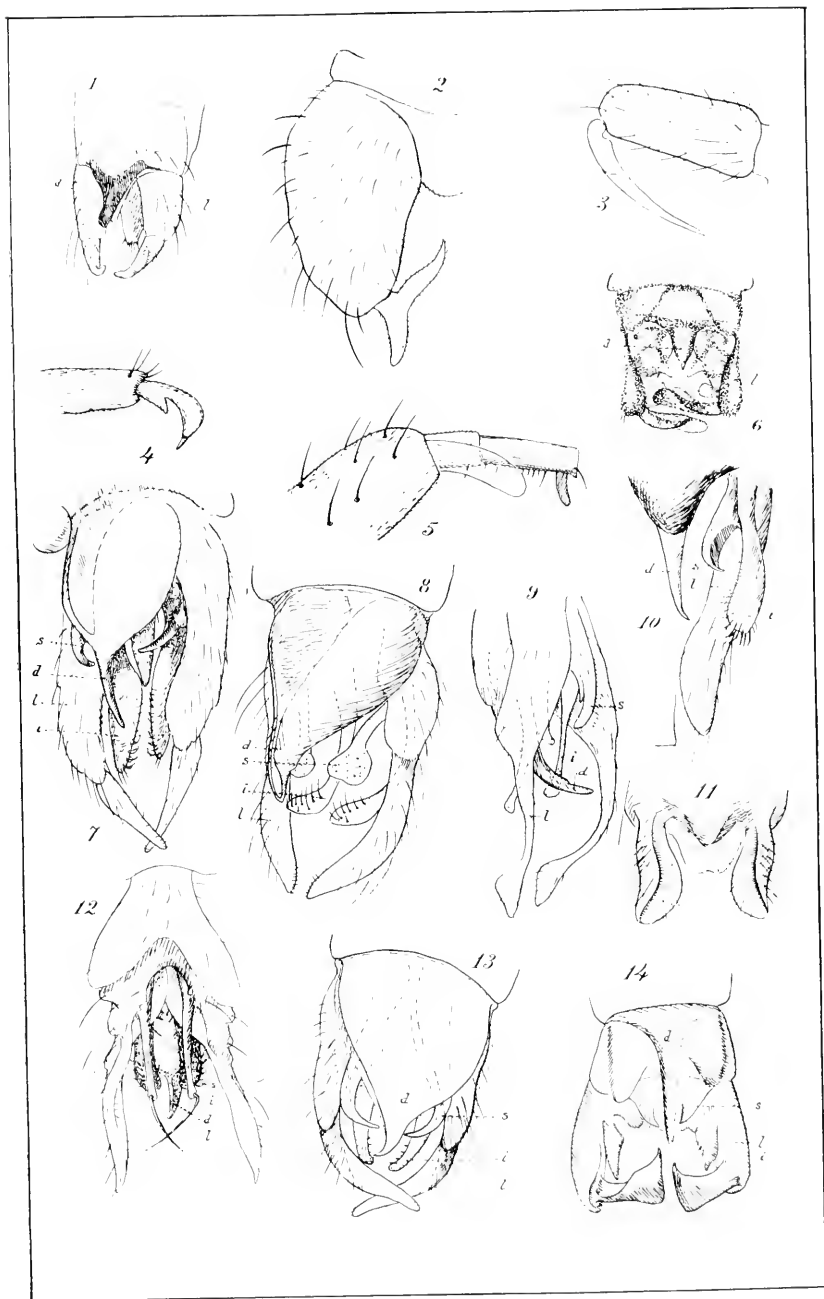
Chironomus (1 to 14), Cricotopus (15-20)

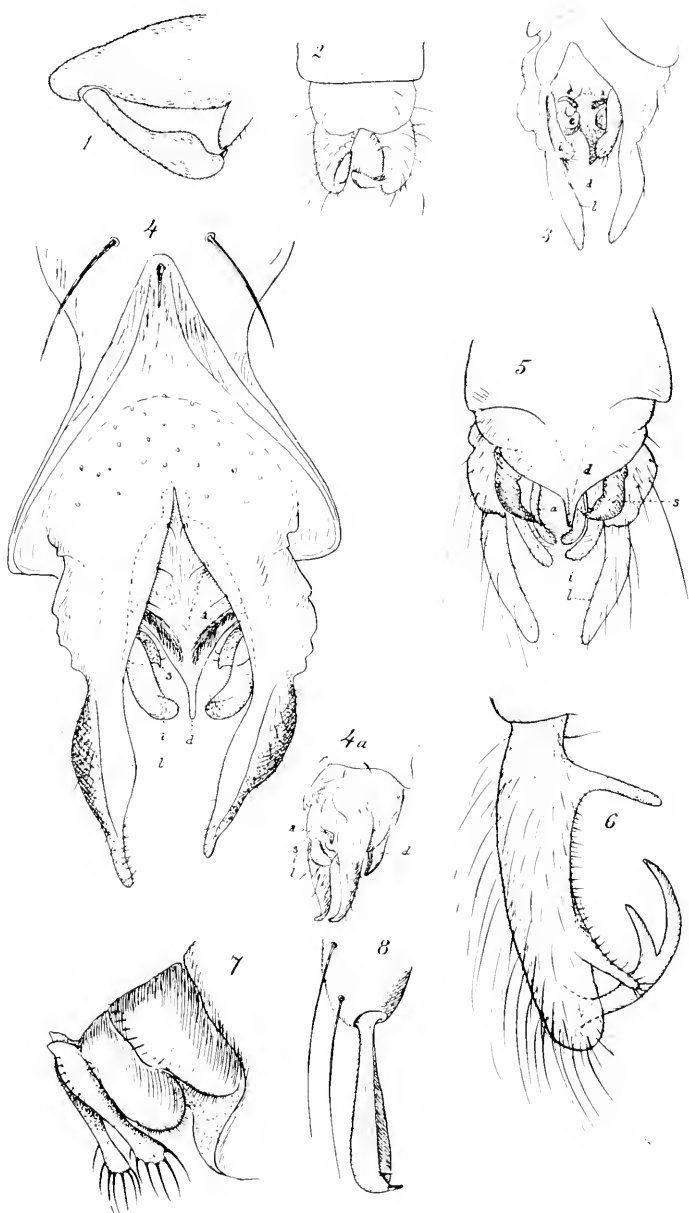


Campylopterus (1 to 4), Orthocentrus (5 to 11), Thalassomyia (12),
Dianesia (13), Tanytarsus (14 to 21)

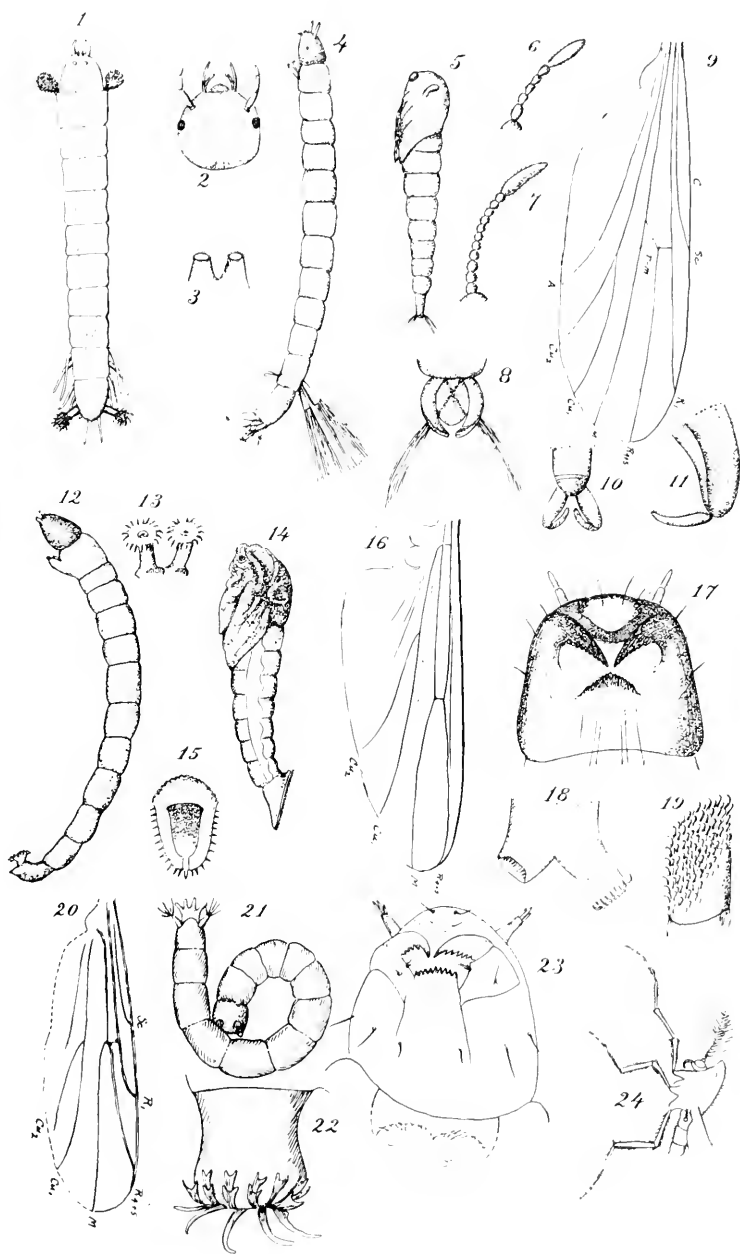


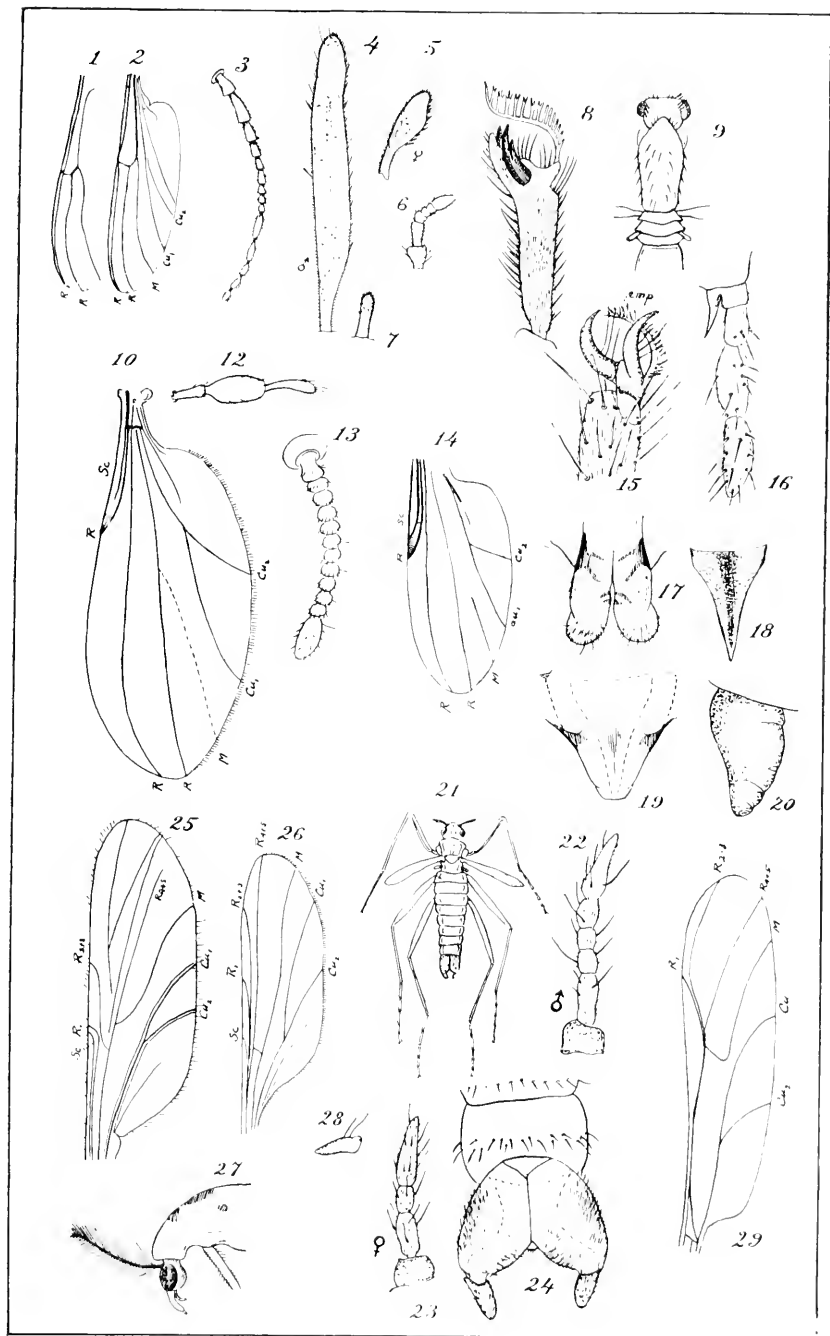
Metricnemus (1 to 5), *Chasmatonotus* (6 and 16), *Diamesa* (7), *Orthocladus* (8), Eggs and egg masses (9 to 15)





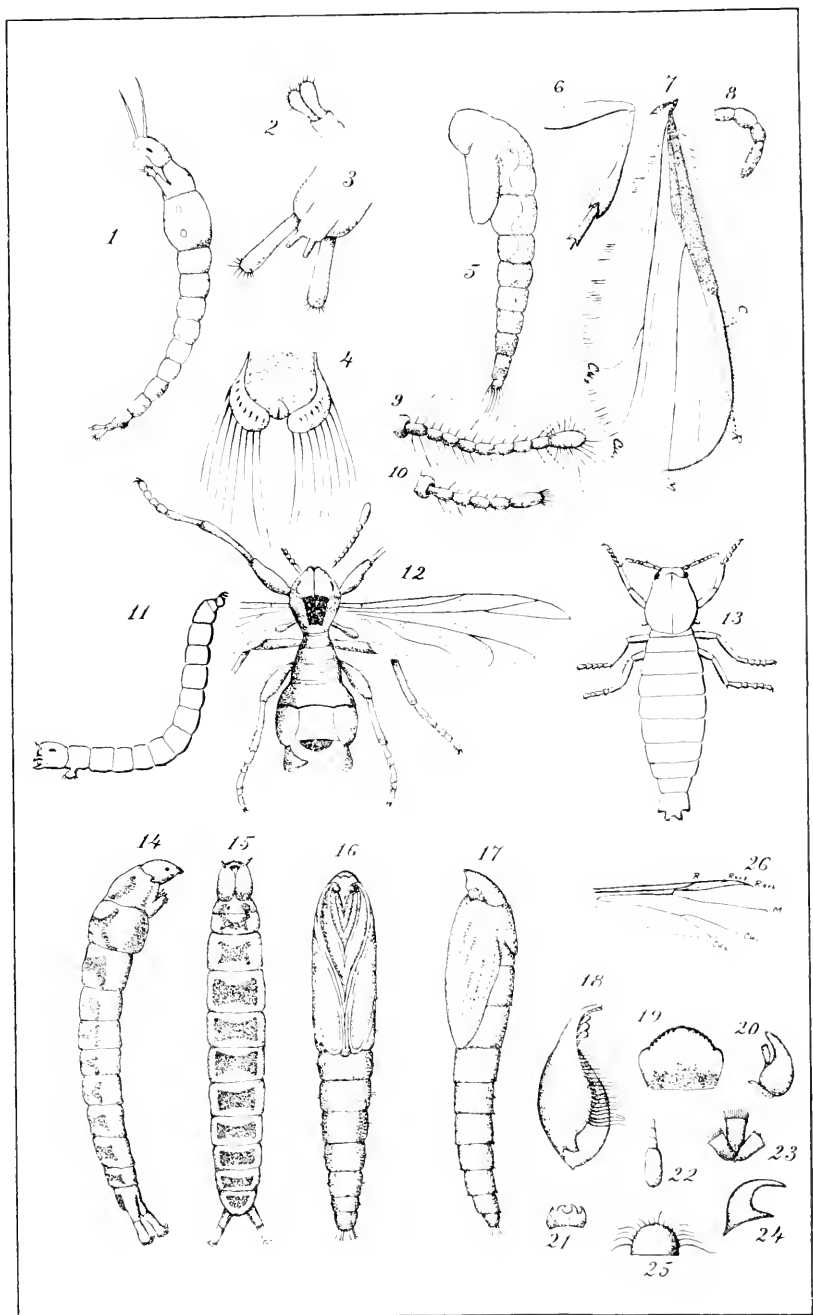






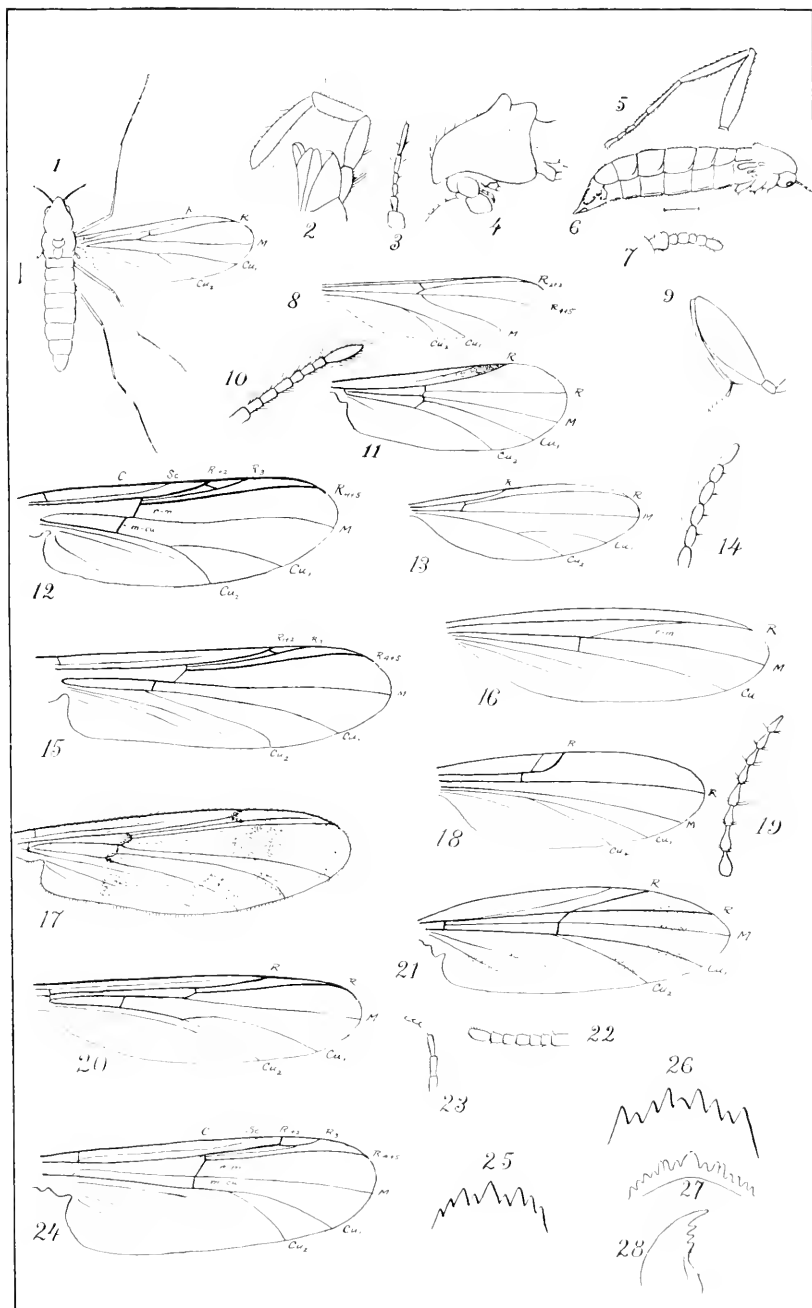
Miscellaneous details





Miscellaneous details

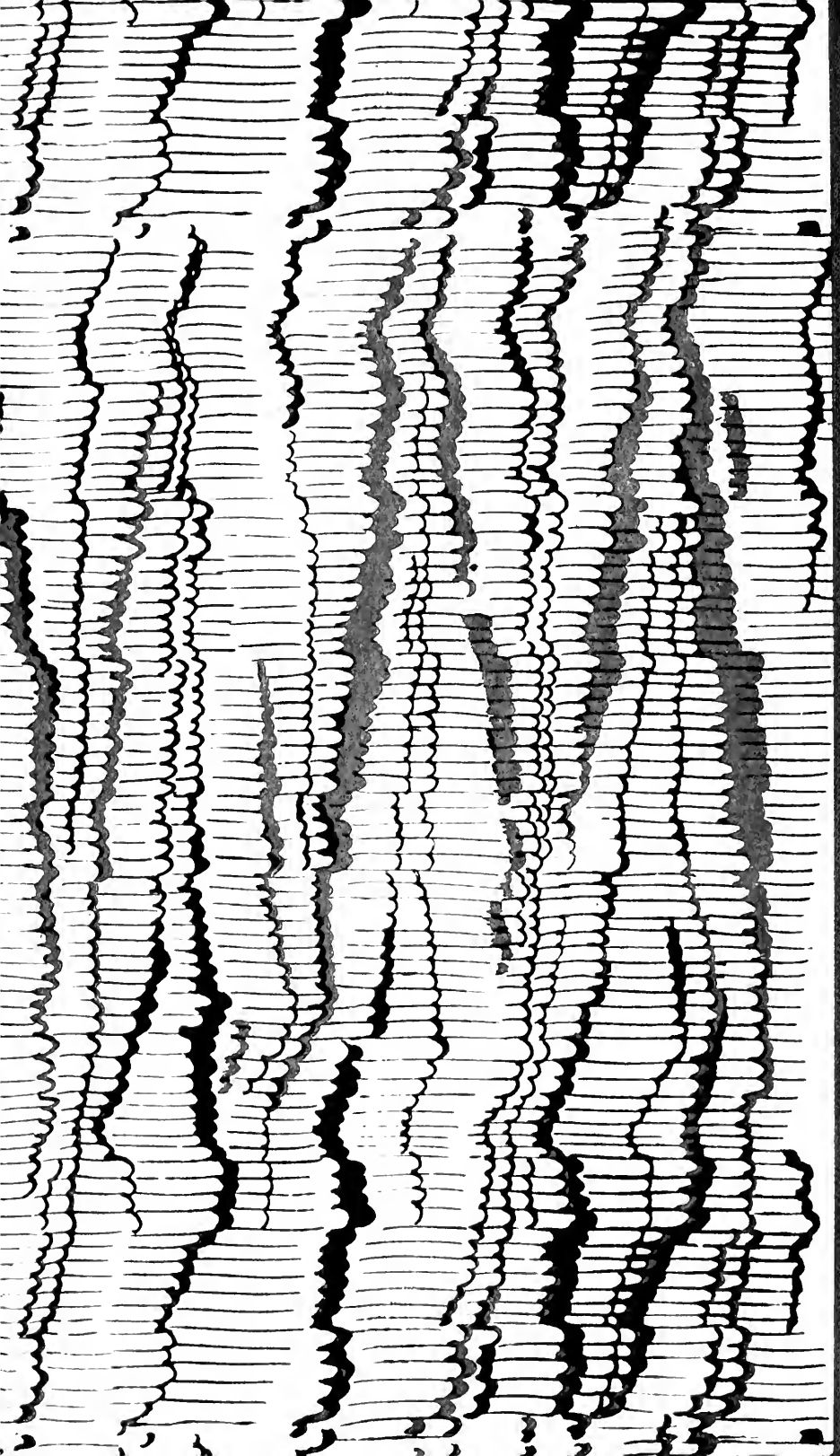




Miscellaneous details







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